MARCH 1954

Futures for Plastics Pipe—UNLIMITED...Page 73

How to CUT COSTS on a Refrigerator Part...Page 82

Your open door is a respected privilege

The Durez field representative who accepts an invitation to talk with you comes from a firm that values his time and yours...

He is unusually well-equipped to render you service involving the profitable use of phenolics in your products, as he speaks for a company that has specialized in these materials from the industry's earliest days.

Apprised of your specific purpose, Durez men can tell which phenolic molding compound among the hundreds commercially used — which industrial or coating resin — will meet your needs best in cost and performance. Their counsel in engineering aspects of plastics design may save you from unforeseen problems.

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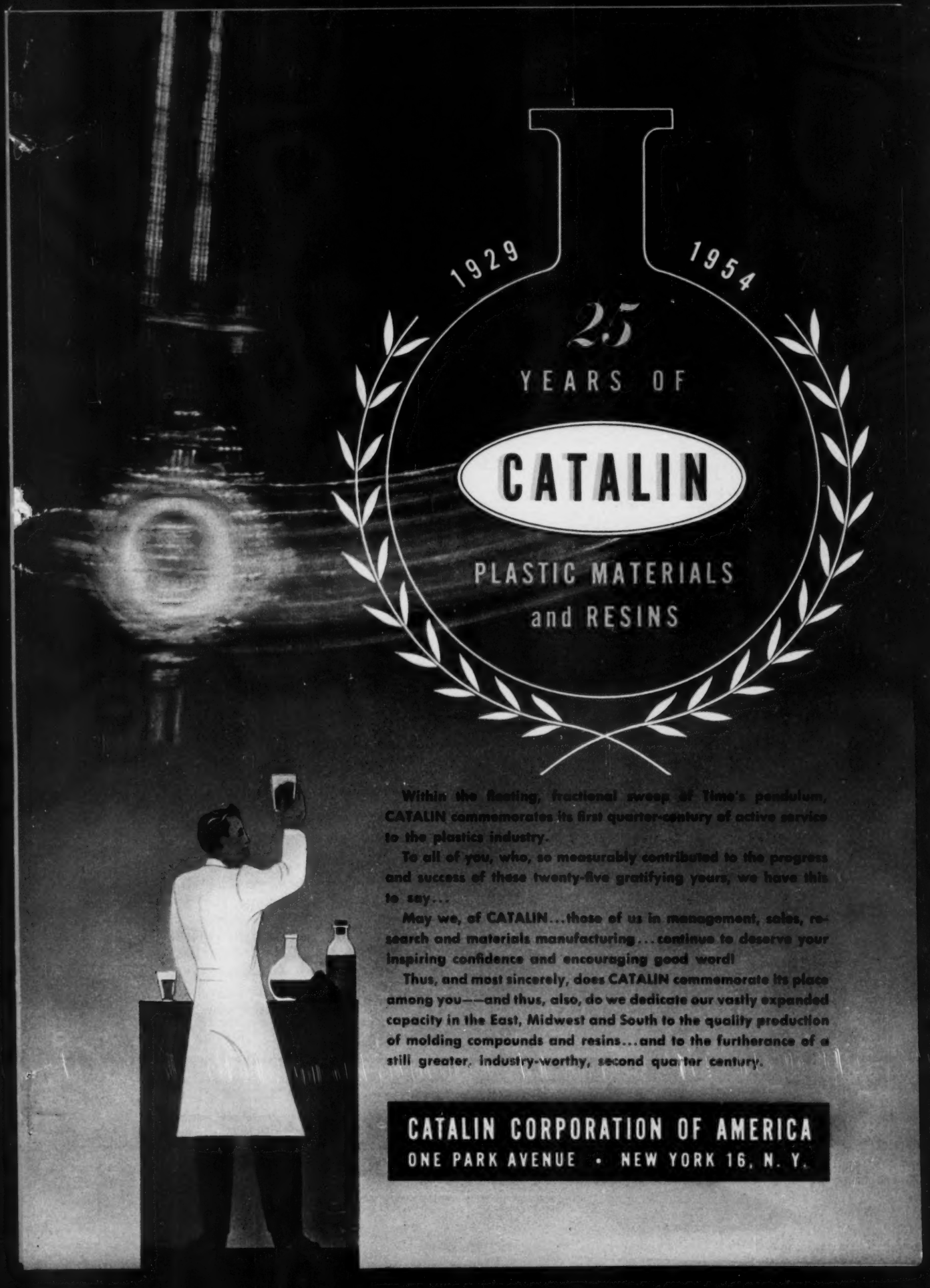
MOLDING COMPOUNDS. Familiar in thousands of products built for rugged service in daily use

PHENOLIC PLASTICS THAT FIT TODAY'S PRODUCTS

for the New Era of Competition

RESINS FOR INDUSTRY. Bonding, casting, coating, laminating, impregnating, and shell molding.



Within the fleeting, fractional sweep of Time's pendulum, CATALIN commemorates its first quarter-century of active service to the plastics industry.

To all of you, who, so measurably contributed to the progress and success of these twenty-five gratifying years, we have this to say...

May we, of CATALIN...those of us in management, sales, research and materials manufacturing...continue to deserve your inspiring confidence and encouraging good word!

Thus, and most sincerely, does CATALIN commemorate its place among you——and thus, also, do we dedicate our vastly expanded capacity in the East, Midwest and South to the quality production of molding compounds and resins...and to the furtherance of a still greater, industry-worthy, second quarter century.

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MODERN PLASTICS*

March 1954 • Vol. 31, No. 7

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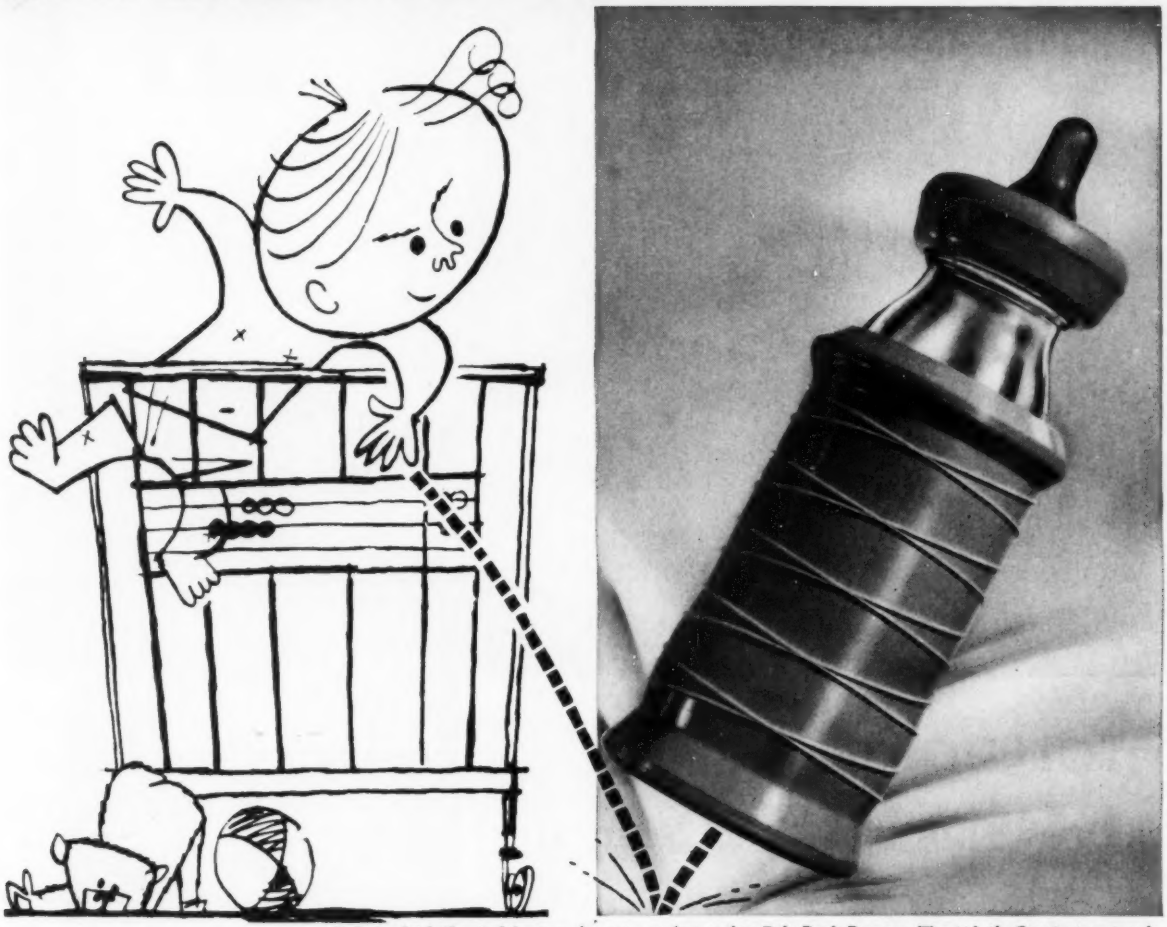
B. F. Goodrich Chemical *raw materials*



B. F. Goodrich Chemical Company does not manufacture these Baby Bottle Bouncers. We supply the Geon paste resin only.

Baby's bottle bounces...won't break!

YOU have probably seen a baby give his bottle the heave-ho—then crash! Dropping milk bottles is so universal that a smart manufacturer has perfected this baby bottle bouncer, precision molded from a plastisol based on Geon paste resin. Drop it and the bottle bounces, unharmed. It gives baby and mother a safe grip, and also acts as an insulator to keep milk at the proper temperature. The bouncer can be boiled or kept in a cold refrigerator without being affected. Comes in 4 baby colors.

You may spot an idea in this new development that shows you how Geon-based plastisols can help you improve or develop saleable products. For example, as packaging for containers of acids, solvents, etc., used in laboratories or in shipping. These plastisols, and other Geon materials have helped build sales for a wide variety of products, from upholstery and wire insulation to rigid piping and even nuts and bolts. Talk over your problems or requirements with us. We'll help you select the Geon material best suited to your needs. For technical information, please write Dept. GB-3, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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It's amazing how many leaders of industry, like Toledo Scale Company, come to Chicago Molded for the best in molded plastics. And, once started, they continue to come year after year. In fact, more than 60% of our business comes from firms we have served 15 years or more. They have learned that here they find complete facilities to handle any molded plastics job from the smallest to the largest part made . . . in large volume . . . and in any material. And they value the sound engineering ability and seasoned judgment . . . the spirit of friendly cooperation . . . and the years of experience that lie behind it all.

This same service is available to you . . . anytime. So . . . if your product calls for the use of plastic parts, talk things over with a Chicago Molded engineer. There's no obligation. Just write, wire or phone.

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EDITORIAL

The Industry Grows Stronger

Editorial treatment of the progress of the plastics industry by financial editors at the year end was the most thorough to date. That, coupled with an increasing flow of inquiries from market analysts and Wall Street economists is indicative of the organizational change this industry is undergoing at processor level.

From an industry comprised of a few huge material producers and a great many small secondary processors (molders, extruders, fabricators), we are changing to a more solid economic format with stronger individual organizations in the processor bracket. It is being accomplished by capital expansion, by amalgamations, and by purchases.

Those who have continuously studied the evolution of the plastics industry note that today capital of not less than a quarter million dollars is needed to enter the reinforced plastics business if a company is to have any hope of success. The article on plastics pipe and fittings and the accompanying chart in this issue of MODERN PLASTICS further illustrates the point as far as the thermoplastics pipe business is concerned. To mold fittings for any reasonable range of plastics pipe produced today would involve at least a third of a million investment in molds alone! And in the coming battle for business a custom injection molder, a compression molder, or a laminator without adequate fixed and working capital will be a sorry gambler.

This trend toward sounder establishment of processing enterprises will give those companies conforming to the new pattern better management, better engineering, better marketing . . . and will make them less dependent on the necessarily grudging paternalism of material makers. It will superimpose industrial statesmanship upon salesmanship and out of this will come an industry strong enough to face up to its magnificent future.

The heads of individual processing companies interested in fitting their future to the trend can get advice and assistance from the management of their material makers, from their corporate lawyers, and from their banks. In some cases, where profit and progress records are not good, they may find themselves with less control than previously . . . . but with increased opportunity, and with authority and responsibility and the tools with which to build their future in better balance.

The trend is a healthy one. It should result in better products and bigger markets for all.

• • •

P.S. Hope you like the new coated paper stock on which MODERN PLASTICS is now being printed. We have adopted this improved stock to bring to our readers an even more serviceable and more attractive magazine. With better paper, printing quality will be better, illustrations will be better, readability will be better . . . . Again, we hope you like it.

NEW CUMBERLAND "STAIR-STEP" DICING METHOD

Dices FULL RANGE of Plastic Materials!

"STAIR-STEP" DICING MACHINE

Plastic sheet material enters machine at right and is processed into cubes below.

CUTS SHEET STOCK INTO UNIFORM CUBES!

Now You Can Choose From TWO Cumberland Dicing Methods

NEW "STAIR-STEP" METHOD is the "universal" dicing method. It dices the *full range* of plastic materials having widely varying physical properties.

WELL-KNOWN "NOTCHED-KNIFE" METHOD dices vinyl materials of medium plasticizer content, vinylidene chloride, and other materials having suitable physical properties.

NOTCHED-KNIFE DICING MACHINE

Cumberland's "Stair-Step" dicing method offers you a *completely new* method of dicing. Perfect cubes are cut from sheet stock in one shearing action! All sides of cubes are cut cleanly. Cubes or rectangular pellets may be produced in various sizes (1/16" to 1/2") by simply changing knives.

WRITE FOR COMPLETE INFORMATION!

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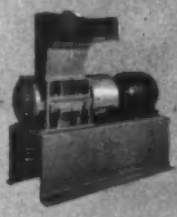
CUMBERLAND MANUFACTURES A COMPLETE LINE OF PLASTICS REDUCING MACHINES

Designed Specifically for Plastics . . . . To Give You Maximum Operating Efficiency and Economy

GRANULATING MACHINES (All Models)

Eight different models, direct coupled and V-belt driven, are available to meet your requirements. For complete details, request Bulletin 231.



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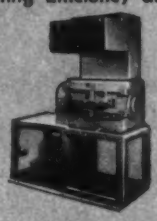
Rugged machine for granulating large "difficult-to-process" plastic parts. Eliminates prior band-sawing. 8" x 20" throat opening.



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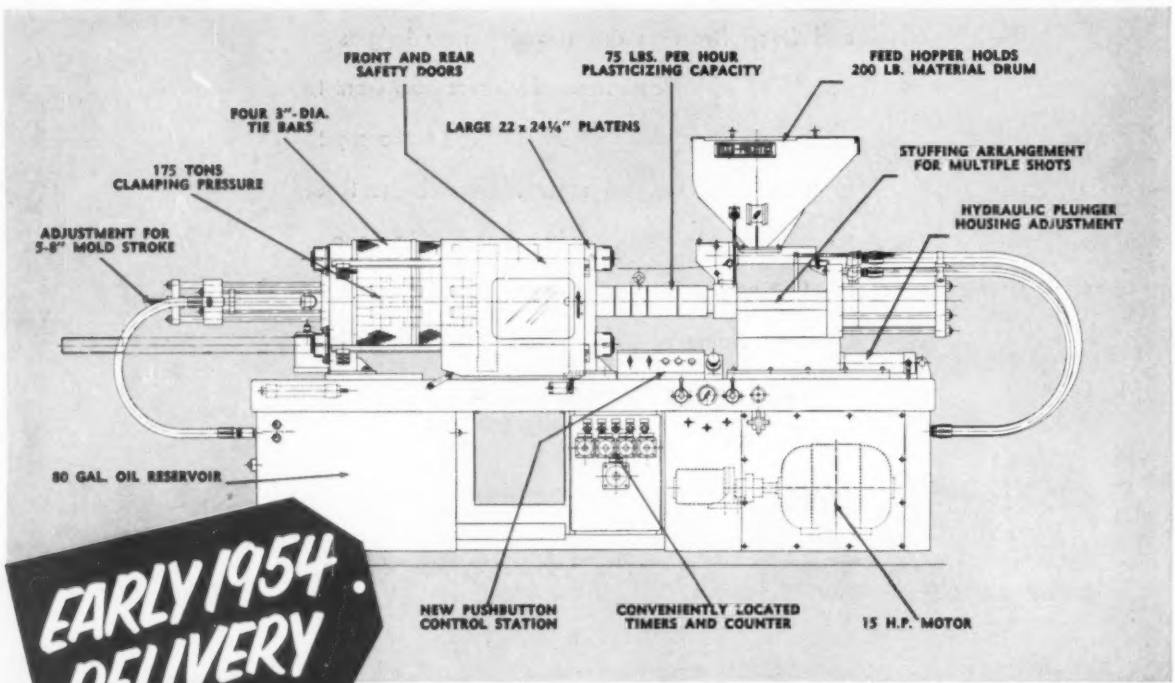
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CONVENIENTLY LOCATED TIMERS AND COUNTER
15 H.P. MOTOR

EARLY 1954 DELIVERY

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The 175T-4/6 not only has speed — up to 600 cycles per hour — but characteristic Reed-Prentice ruggedness and *extra* molding capacity. Stuffing arrangement permits "shots" up to 6 oz. or more through multiple strokes.

Newly-designed heating cylinder with ceramic elements plasticizes up to 75 lbs. per hour. Large platens accommodate molds up to 24¼" x 13½" and provide 75 sq. in. projected casting area.

For fully automatic molding on the 175T-4/6 oz. "Reed", a low pressure die closing attachment is available. This unit prevents mold damage and permits one man to tend several machines.

Write today for literature on the new 175T-4/6 oz. machine and the special bulletin on "Fully Automatic Molding".

"Reeds" available in 4, 6, 8, 12, 16, 20, 24, 32, 48 and 200 oz. capacity.

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MR-28 RL

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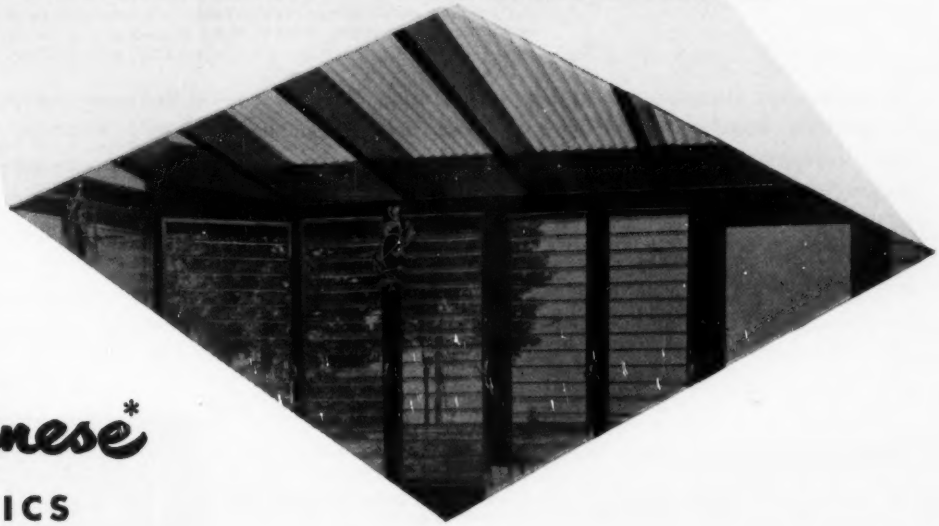

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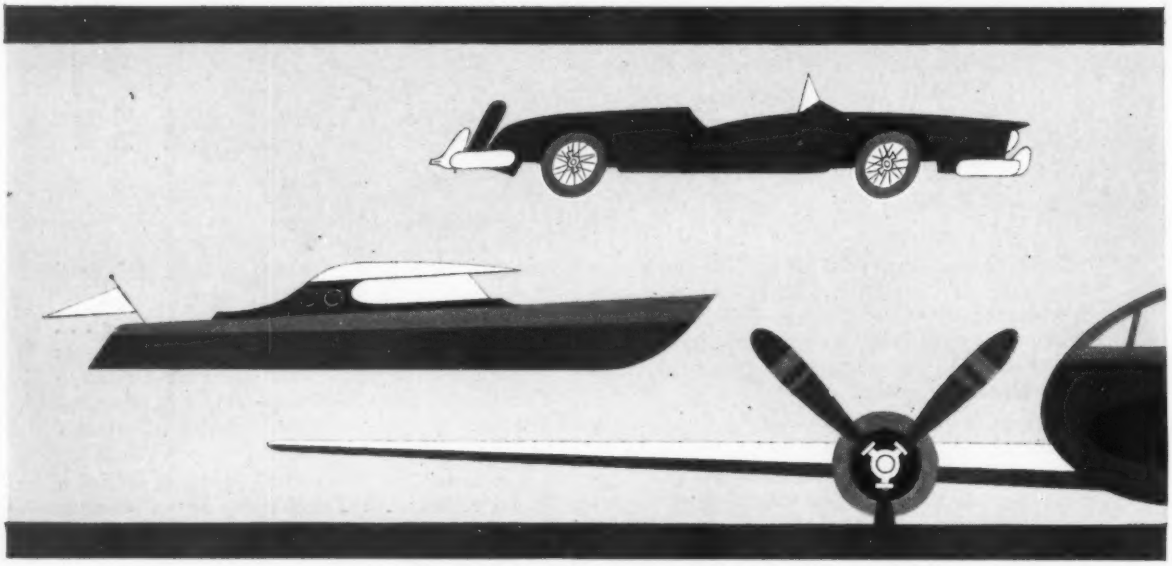

In the aircraft, automotive and marine fields . . . in fields where improved wet strength is important, new Fiberglas silane-sized roving promises to make good products better, new products possible.

Yes, greater wet strength—and that's not all. Fiberglas roving in new "hard" and "soft" silane sizes gives considerably increased *dry* strength, too. Tests by five separate laboratories proved this roving ideal as the base material for the body of a well-known new sports car . . . proved conclusively that this Fiberglas roving bonds better chemically and mechanically to the molding resin . . . proved that it outperforms all other existing rovings in preform moldings. Yet it costs no more than other quality rovings. And compared on an equal wet strength basis with standard chrome roving, this new silane-sized roving is actually priced lower. If you're looking for higher wet and dry strengths in your plastic moldings, look into Fiberglas roving with the new silane sizes. Please write:
Owens-Corning Fiberglas Corporation, Plastics Reinforcement Division, 598 Madison Avenue, New York 22, N. Y.

leading a great new industry forward . . .

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FIBERGLAS

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If you are not already using a Plastolein Plasticizer, order enough for a plant trial, and prove to yourself the many advantages of these time-tested, trouble-free Plastolein Plasticizers.

Check these Plastolein Plasticizers for those applicable to your Operation—

PLASTOLEIN 9050 DHZ—(di-2-ethylbutyl azelate)—an efficient specialty plasticizer for high clarity vinyl films and other elastomers where low-temperature flexibility is essential.

PLASTOLEIN 9058 DOZ—(di-2-ethylhexyl azelate), **PLASTOLEIN 9057 DIOZ**—(di-iso-octyl azelate)—good all around basic plasticizers that also impart excellent low-temperature properties. Their outstanding combination of properties leads to their use in any vinyl product.

PLASTOLEIN 9055 DGP—(diethylene glycol dipelargonate)—a general purpose auxiliary plasticizer for imparting low-temperature flexibility, excellent "hand" and drape to vinyls. Also for Neoprene and Buna-N rubbers.

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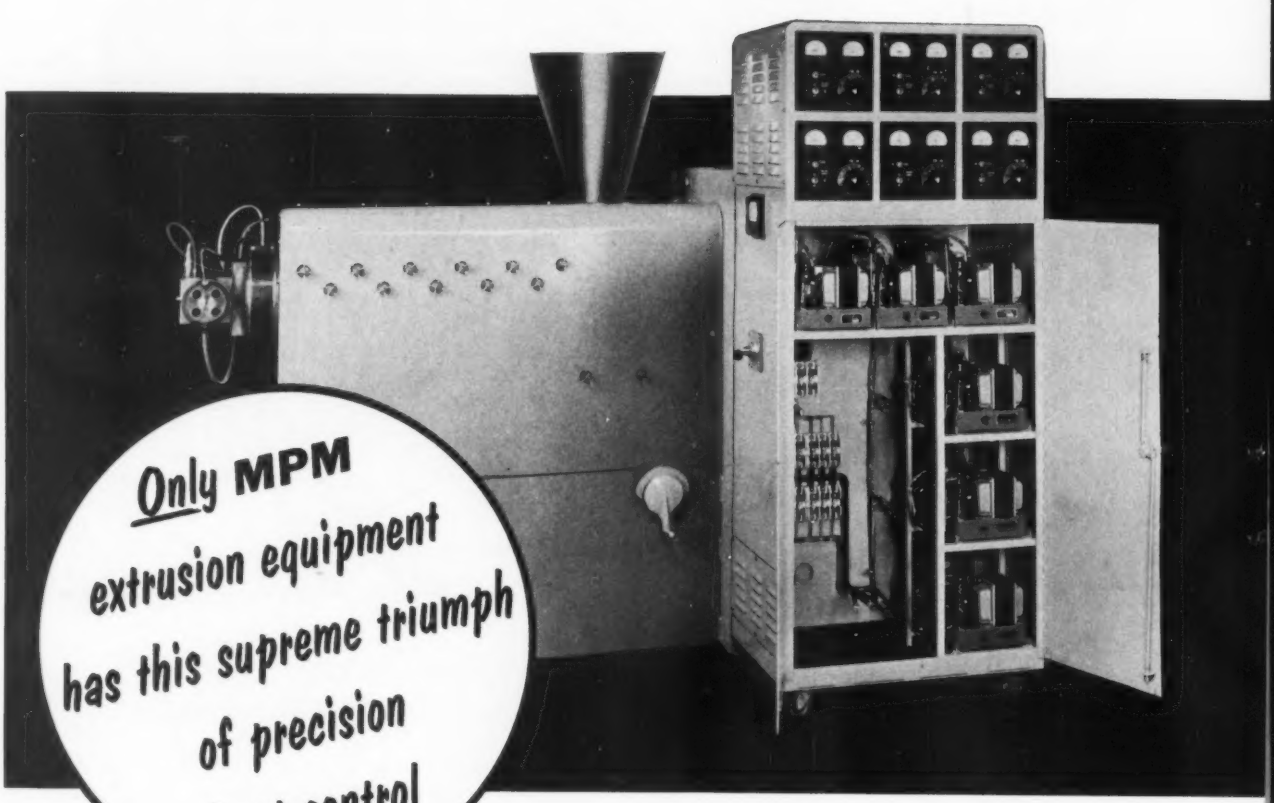


The entire history of plastics extrusion has been a constant struggle to keep the material in the extruder at the desired temperatures. Now, the problem has been licked!

MPM extruders, long recognized as the most outstanding, are now available with wonderful "electronic brain" heat controllers which replace out-dated "on-off" temperature regulation with stepless continuous temperature regulation of unrivalled, undreamed of accuracy.

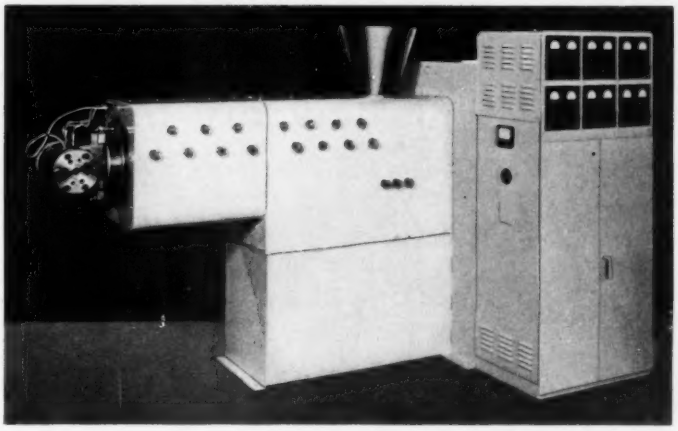
The operation of MPM Electronic Heat Controllers is based on the same type of electronic compensation circuits which control pilotless aircraft and guided missiles. They are virtually immune to moisture, vibration, dirt, and other common industrial hazards which influence the accuracy of other heat control devices. Minimum operator attention is required.

FULLY TESTED

MPM Heat Controllers are the result of more than three years of intensive research, testing and development by leading electronic scientists and extrusion engineers. After supervising a test installation using *fifty* of these new controllers, the production supervisor for a leading extruder declared that MPM had "*changed the art of extrusion to a science.*"

BANISHED!

MPM "Electronic Brain" Heat Controllers Establish a New Era in Extrusion History



The world-famous MPM 4½" extruder.

CONSIDER THE ENORMOUS ADVANTAGES AVAILABLE EXCLUSIVELY WITH MPM ELECTRONIC CONTROLLERS

Precision control: The instruments supply *exactly* the right heat needed for a specific application. No moving parts, relays, switches, valves, contacts, motors or photocells complicate the operation. The pre-set temperature is not overridden; a call for heat and its delivery occur simultaneously.

Higher production: Set-up time is shortened drastically and scrap losses are reduced to a tiny fraction of what previously has been accepted as normal. With temperature practically eliminated as a variable, better tolerance control than ever before is achieved.

Lower costs: MPM Heat Controllers pare electric consumption. Since they permit tolerances to be controlled so very accurately, they reduce unnecessary "give-away" of plastic resins. For instance, they eliminate the need for making 1½ mil film to be certain that a 1 mil specification is met.

ON ALL OTHER COUNTS, MPM EXTRUDERS ARE BETTER THAN EVER BEFORE

Not content to rest in their position of leadership in the extrusion field, MPM is incorporating additional optional features in their new machines. These features include new high-efficiency specially-designed heaters of our own patent pending construction, custom-designed screws, new extra-length cylinders, and overhanging cylinders which permit auxiliary equipment to be placed directly beneath the die head.

Of course, the other well-known superiorities—solid corrosion resistant interior parts, simplified installation, built-in speed indicators, multiple cooling zones, cored screws—are still MPM features. *Full details about MPM extruders for doing any extrusion job better will be sent you on request.*

West Coast Representative
4113 West Jefferson St.
Los Angeles 16, Calif.

modern plastic machinery corp. fpm

15 Union St., Lodi, N. J., U. S. A.
Cable Address: MODPLASEX

NOW-HOSE IN A HURRY

with new, dry-blending PLIOVIC DB80V

MOLDERS and extruders! Here is a new resin specifically designed to let you turn out quality hose—or any molded or extruded item—in a hurry. It's PLIOVIC DB80V – a tailor-made, polyvinyl chloride that has all the properties a good, dry-blending resin should have.

Free-flowing characteristics. Adequate heat stability. Ready moldability and extrudability. Maximum physical properties. All these requirements have been built into PLIOVIC DB80V to permit economical compounding of quality products on conventional equipment.

Key to the excellent dry-blending properties of PLIOVIC DB80V is its ready and regulated absorption of plasticizer. This, in turn, results from careful control of particle size and distribution. Particles of PLIOVIC DB80V are dry, free-flowing and of irregular surface. This structure encourages absorption. Their narrow size range makes this absorption uniform. The result is fast, efficient compounding.

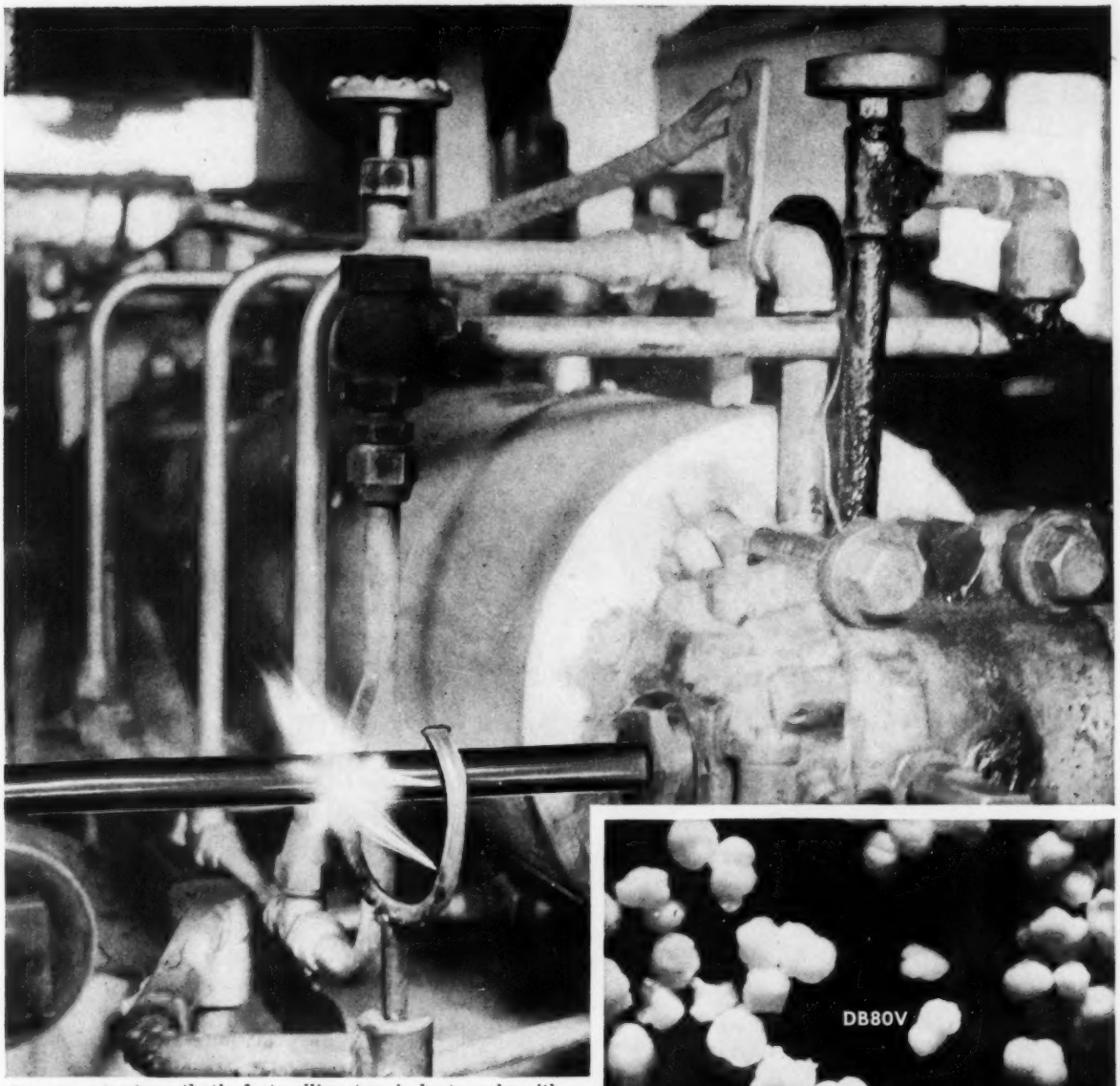
Only moderate heat is needed to mix PLIOVIC DB80V compounds. Thus, only a brief heat history is developed. This adds up to greater stability during the more severe conditions of forming and the useful service life of the end product.

If you haven't tried PLIOVIC DB80V, you should. And you can, simply by writing for samples and technical help to:
Goodyear, Chemical Division, Akron 16, Ohio

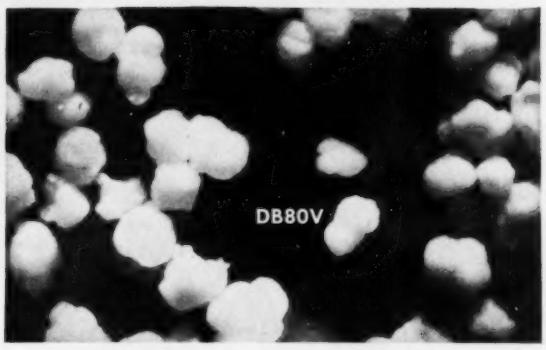
CHEMICAL GOODYEAR DIVISION

Chemigum, Pliobond, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

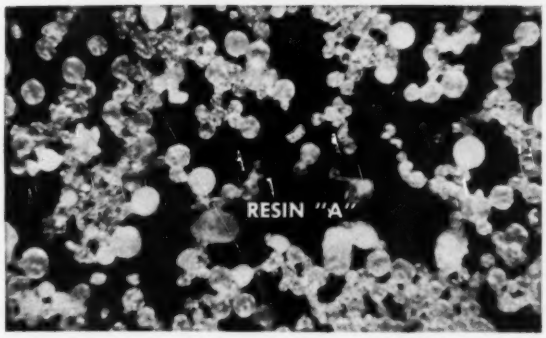
Use-Proved Products — CHEMIGUM • PLIOBOND • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS — The Finest Chemicals for Industry



Fast processing hose, that's fast selling too, is best made with PLIOVIC DB80V—thanks to its unique dry blending and extruding characteristics and its top physical properties.



PHYSICAL PROPERTIES OF PLIOVIC DB80V	
Composition	100% Polyvinyl Chloride
Color	White
Nature of Particle	Dry, free-flowing
Size Distribution of Particles	100% thru 40 mesh
	80-100% thru 80 mesh
	0-15% thru 200 mesh
Intrinsic Viscosity	0.80 Av.
Specific Gravity	1.40 Av.
Bulk Density	38 lbs./cu. ft. av.



Excellent dry blending of PLIOVIC DB80V results from the type and size of its particles. These photomicrographs illustrate the differences between particles of PLIOVIC DB80V and those of a conventional, general purpose resin.

only a few inches more floor space than the smallest grinder

but *MORE THAN TRIPLE THE PRODUCTION CAPACITY*

B&J "IDEAL" GRINDERS

STANDARD IDEAL *FOR BESIDE-THE-PRESS and ACCUMULATED SCRAP*

If you're a big injection molding plant, you'll use the B & J Standard Ideal for beside-the-press grinding and get up to 250 pounds an hour. Smaller shops use it for accumulated scrap. Large plant or small, you'll appreciate the compact size of the machine—only 27" x 36" of floor space. You'll like its rugged strength — built for long, trouble-free performance — as well as the powerful 2 or 3 H.P. motor and the quick, easy way it is cleaned. Your choice of 3½"x10" or 6"x10" throat opening, fits the Standard Ideal to your requirements for grinding medium area rejects as well as sprues and runners. Satisfied shops all over the world agree, "It's the finest small size machine available."

HEAVY DUTY IDEAL *FOR TOUGHER MATERIALS*

Extra heavy castings, heavier knives and extra strong construction throughout, enable the Heavy Duty Ideal to grind up to 250 pounds an hour of your toughest materials — such as butyrates and vinyls — small bleeder stock as well as accumulated scrap and rejects. Only 28" x 37" of floor space. Powered by a 5 H. P. motor. Your choice of 3½" x 10" or 6" x 10" throat opening.

Both the Standard Ideal and the Heavy Duty Ideal are priced within the range of every shop. *Why not send samples of your materials for grinding in our testing laboratory. Tell us your production requirements and we'll recommend the machine best suited to your needs. Or, send for our complete catalog.*

Remember, Only B & J Makes a Complete Line of Grinders

BALL & JEWELL, INC.

22 FRANKLIN STREET **EVergreen 9-6580** **BROOKLYN 22, NEW YORK**

RESISTS almost EVERYTHING

KEL-F* properties

- Chemically Inert to All Acids, All Alkalis, Solvents
- Excellent Compressive Strength . . . 32,000 to 80,000 psi.
- High Dielectric Properties
- Zero Water Absorption
- Wide Temperature Utility—from −320° F. to +390° F.
- Dimensionally Stable—unaffected by temperature, moisture, age
- High Impact Strength. Low Cold Flow
- Non-wetting

*Trade Name of M. W. Kellogg Co.

KEL-F* Parts Compression-Transfer-Moulded by K-K Of Special Interest to the Chemical, Electrical and Food Processing Industries

Check the partial list of KEL-F properties. Determine for yourself where and how these characteristics can improve your product or procedures. If the application is highly specialized, then the Kurz-Kasch method of compression-transfer moulding *might* be your logical answer.

As examples of the benefits you can expect, the chemical pump parts and integrally-moulded valve liners pictured above will, through their chemical inertness alone, give infinitely more satisfactory service and freedom from expensive maintenance and replacement. Also, note a large electrical insulator moulded around a complex insert.

These are the kinds of fluorocarbon applications we specialize in—those parts that can best be compression-transfer moulded. Send us your inquiries on KEL-F—on Teflon—on moulded glass-filled polyesters—or any thermo-setting materials. We're equipped and ready for compression, transfer and plunger moulding exclusively—and anxious to work into your plans for the earliest feasible moment. Just write or call.

KURZ-KASCH

Specialists in Thermo-Setting Plastics for 37 years

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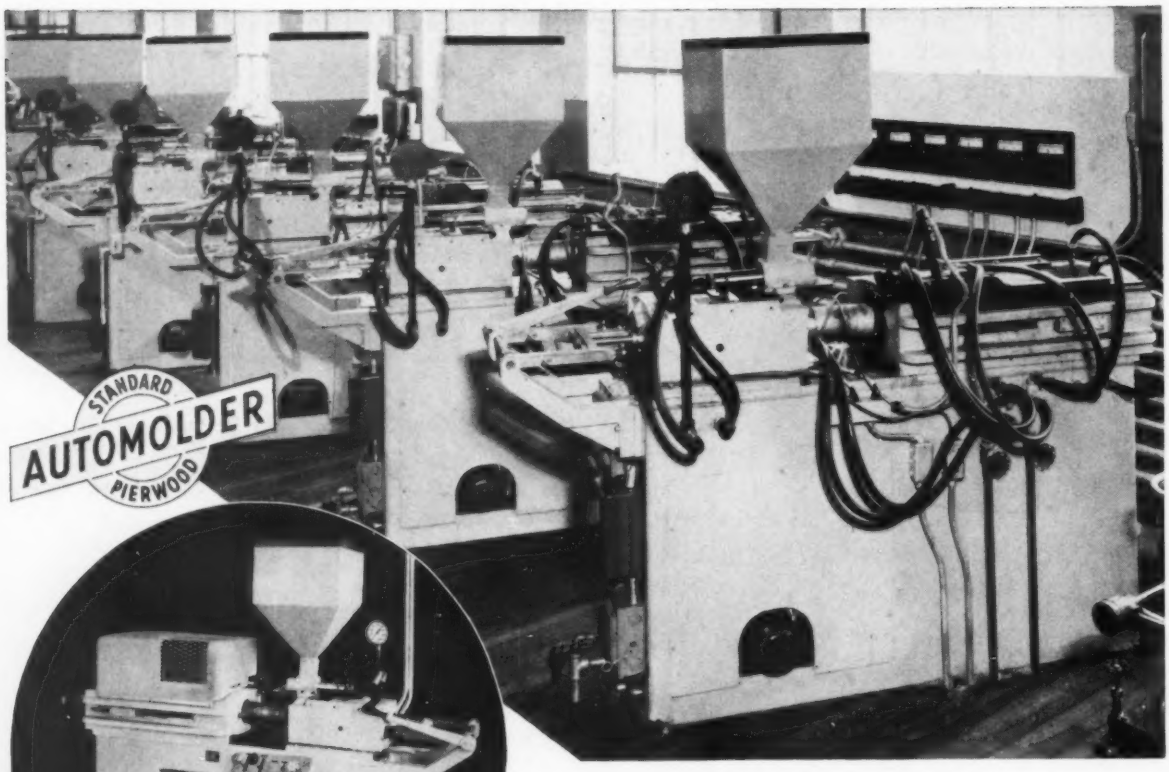
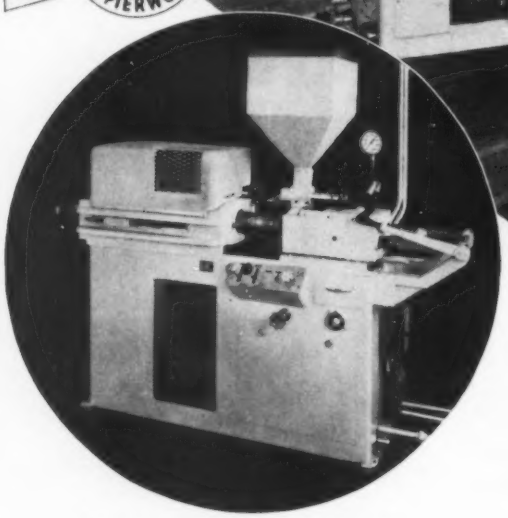




Photos Courtesy Queen Products, Providence, R.I.

Fully Automatic Molding

FOR GREATER ECONOMY . . . SPEED . . . SAFETY

at Unbelievably Low Cost!!

The Standard Pierwood Automolder

offers positive mold protection against closing on unejected parts. One 15 hp. motor operates three machines with Vickers pump and control valves. Complete, positive and simple mechanical controls. No timers necessary.

- 1½ oz. Capacity
- 1200 Shots per hour
- 30 lbs. per hour
- 9 x 10 Mold space
- 12¾ Daylight
- 6¾ Max. stroke

LOW
MOLD COST
MAINTENANCE
LABOR COST
POWER CONSUMPTION
REJECT PARTS

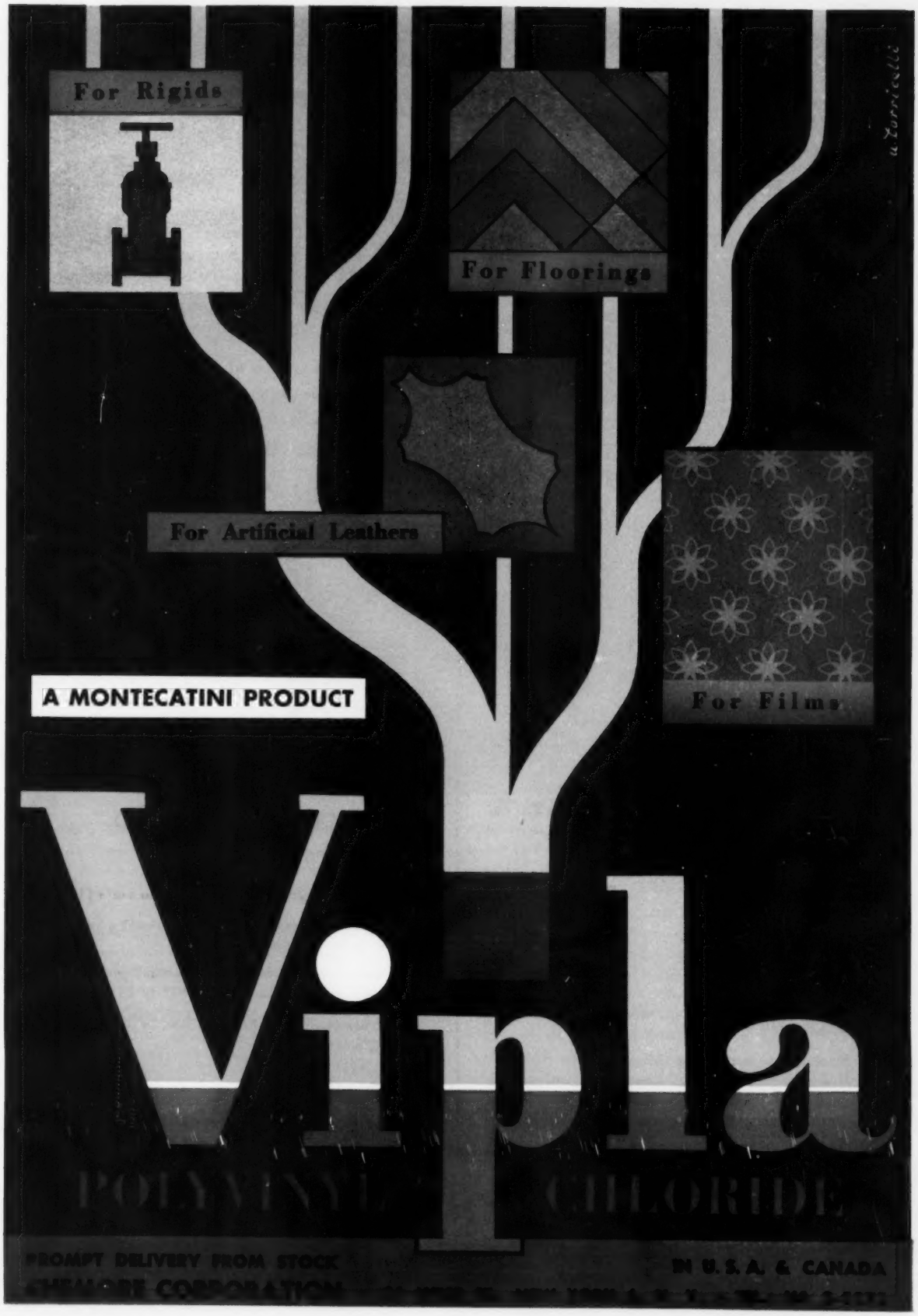
For further information write to
Kavanagh Sales, Inc. . . . Leominster, Mass. . . . Sole Agent

BUILT BY **STANDARD TOOL COMPANY** 83 WATER ST., LEOMINSTER, MASS.

DESIGNERS AND BUILDERS OF MOLDS FOR PLASTICS FOR FORTY-THREE YEARS

Australian Plant, Standard Tool Co. (of Australia), PTY. LTD., Sidney

Foreign Representatives, OMNI PRODUCTS CORP., 400 Fourth Avenue, New York 16, New York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For Artificial Leathers
For Films
A MONTECATINI PRODUCT
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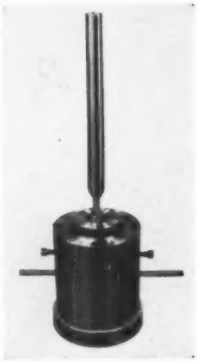
PROMPT DELIVERY FROM STOCK
IN U.S.A. & CANADA

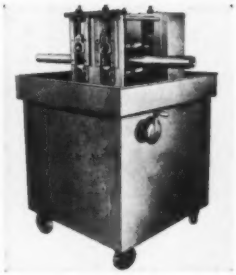
ROBBINS

EXTRUSION EQUIPMENT FOR PLASTIC PIPE

POLYETHYLENE PIPE DIES

- Diameters from ½" to 6" inclusive
- Choice of water or air cooled mandrels



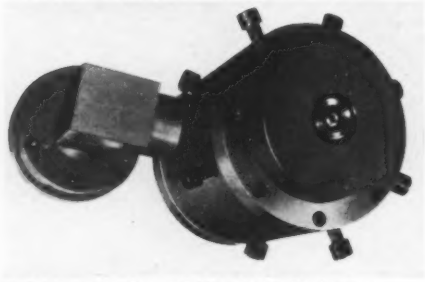


PIPE PULL-OFF UNIT

This unit is adjustable to handle pipe from ½" to 6" diameter. Dual rollers prevent slippage. The bottom roller runs in a water bath to insure proper cooling. The height of the take-off is adjustable from 36" to 44".

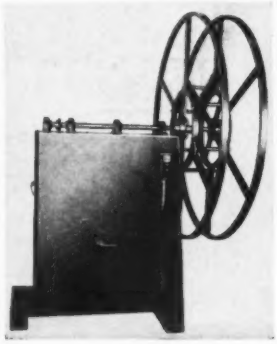
- Convertible to a capstan by merely changing rollers
- Supplied complete with U. S. Varidrive motor and switch

OFFSET TYPE DIES FOR BUTYRATE OR POLYSTYRENE



- Diameters from ½" to 6" inclusive

PIPE COILING MACHINE



Here is a Robbins designed and built unit which meets the requirements of many producers. Quickly and efficiently, it makes a neat coil of any pipe from ½" to 3". Basic equipment includes 3 small reels and 2 large reels which can be changed in a matter of seconds.

- Powered with a U. S. Varidrive motor

REFRIGERATED WATER TANK

Experience has proven this Robbins unit to be highly efficient in helping maintain accurate control of pipe dimensions.

- Equipped with slots for sizing rings
- Sizing ring holders and sizing rings optional
- Adjustable height
- Mounted on ball bearing casters

PLASTIC EXTRUSION DIES A SPECIALTY

- Prices furnished on request for rigid vinyl pipe dies
- All sizes of inside and outside cooling rings furnished from stock
- Robbins designs and builds special pipe dies for all materials, in sizes from .187" to 12" O.D.
- Cutting equipment designed and built to customer specification

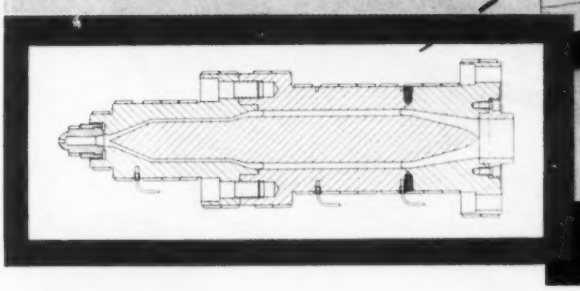
ROBBINS TOOL & DIE CO.

1430 Mishawaka Elkhart, Indiana

IT'S RED HOT

H-P-M's NEW HEATING CHAMBER

INCREASES PLASTICIZING CAPACITY 100%



NEW HEATING CHAMBER DESIGN now standard on all H-P-M 9, 16, 32 and 60 oz. plastics injection molding machines.

40% SAVINGS IN CYCLE—Example: A 7½ oz. shot, formerly molded on a 12 oz. competitive machine in 37 seconds, is now molded in H-P-M's new 9 oz. in just 23 seconds . . . a 14 seconds saving per shot.

HOW ABOUT WALL TILE? Example: H-P-M's 16 oz. with new heater is producing tile (4½"x4½"x.065" thick) in an 8-cavity mold on an 18-second floor to floor cycle!

QUICK COLOR CHANGE—Example: When molding cellulose acetate, the new H-P-M 9 oz. requires only 7 lbs. material to change from flesh color to white!

EASIER MOLD FILLING—Example: In testing new molds, a 48-cavity doll arm mold was filled in first shot with H-P-M's new 9 oz.

- 3-zone heat control with concentration of high-wattage heaters at chamber entrance.
- Heat is applied directly to spreader, eliminating air gaps and resultant heat loss.
- Narrow, high-temperature heating bands, with stainless steel clamps, provide excellent contact with chamber.
- High efficiency of new chamber lowers heat requirements approximately 100° F. and injection pressures reduced as much as 3000 P.S.I. on the material.
- New chamber is ideally suited for all modern thermoplastic materials — including flexible vinyl.
- Chamber is easily dismantled for cleaning.
- Improved terminal block — mounted directly on chamber —eliminates need for long wire leads.
- H-P-M's threadless, quick-change nozzle tip can't break off in the chamber!

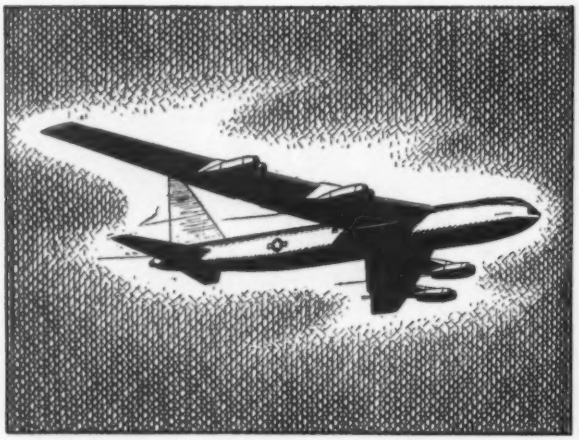
WRITE FOR FULL DETAILS TODAY!

HPM

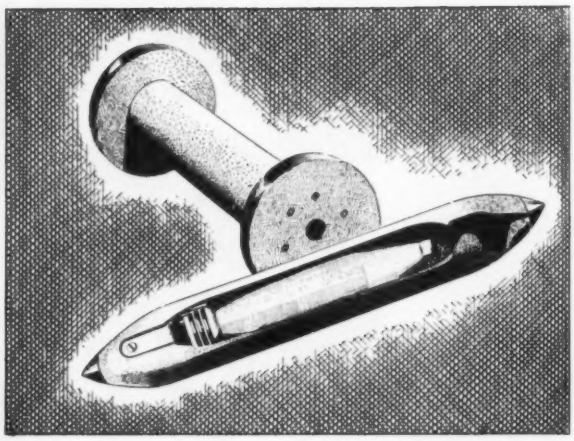
THE HYDRAULIC PRESS MFG. COMPANY

1010 Marion Road, Mount Gilead, Ohio, U. S. A.

PRESSES FOR EVERY PRESSURE PROCESSING APPLICATION

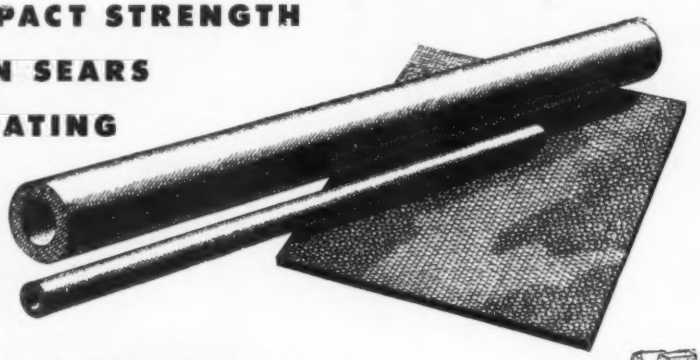


Wellington Sears filament nylon fabrics provide outstanding impact resistance to low pressure laminates, such as wing board liners for military aircraft.



Lantuck non-woven fabric is an economical reinforcement for laminates requiring superior mechanical strength, mirror-smooth surfaces and easy machineability.

YOU GET HIGH IMPACT STRENGTH WITH WELLINGTON SEARS DUCKS FOR LAMINATING

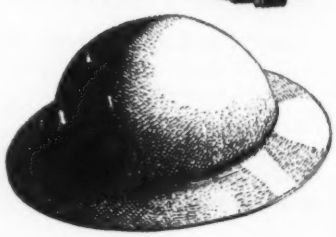


For years Wellington Sears ducks have been favored by laminators for use in reinforced plastics. These top quality fabrics provide outstandingly high impact strength.

Wellington Sears single filling duck has the right weight and rugged, hard-gripping texture to make an excellent reinforcement for C grade laminates where high impact strength is of first importance. Available in weights from about 8—15 oz. per square yard in widths of 29" and wider, it's being used in sheet stock and tubing, safety helmets, heavy-duty gears and mechanical parts of many kinds.

"Superior" army duck is another heavy, rugged fabric, ideal for shock-resistant laminates. Its plied-yarn construction insures high fiber density and freedom from sizing substances that sometimes hinder impregnation.

In addition to ducks, Wellington Sears has a complete line of drills, sheetings, and numerous special constructions available for laminators. A call or letter to our nearest sales office will bring you co.nplete information.



Superior Fabrics for Coating and Laminating

Single filling ducks	Broken twills
Army ducks	Drills
Single and plied-yarn chafers	Sheetings
Special ducks	Nylon, rayon, Orlon® and other synthetics
Sateens	Lantuck non-woven fabrics
Twills	

*DuPont's trademark for its acrylic fiber

Write for a free copy of "Modern Textiles for Industry" which includes pertinent information on fabric-and-plastic applications. Address: Wellington Sears Co., Dept. J-, 65 Worth St., New York 13, N. Y.*

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An Old Crab and a Young One

"Child," said the Mother, "you must use yourself to walk straight, without skewing and scuffing every step you take." "Pray, Mother," said the Young Crab, "do but set the example yourself and I'll follow you." —*Aesop*

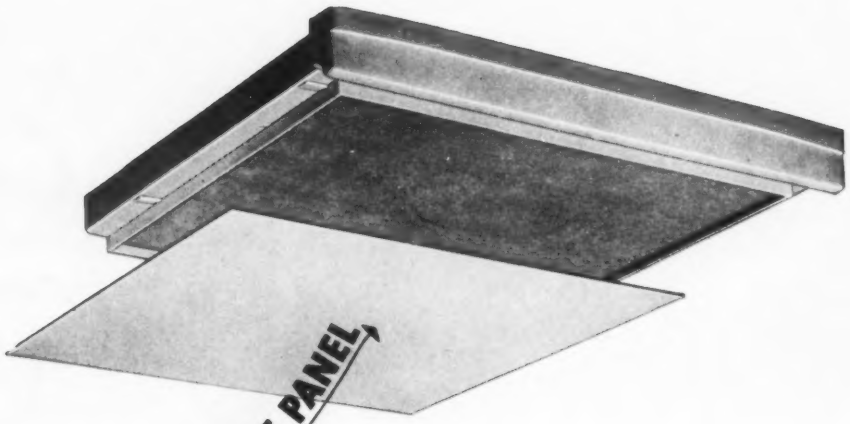
Plenco has consistently endeavored to set the example in producing quality controlled Phenolics for almost every application.

PLENCO PHENOLICS

FOR BETTER PLASTIC PRODUCTS

PLASTICS ENGINEERING COMPANY

Sheboygan, Wisconsin



POLYFLEX® SHEET REPLACES MOLDED STYRENE PANEL,

SAVES 55¢ PER UNIT

problem: Original specifications for a Westinghouse refrigerator baffle assembly called for a bottom panel .100″ thick. Normal procedure would be to mold the assembly in two parts in order to get the desired thin panel in the bottom section. Estimated cost for the molded bottom section was 75 cents.

solution: In replacing this section with Polyflex, an oriented polystyrene sheet, the molder provided a tough, thin panel for only 20 cents. High strength of Polyflex permitted use of only .020″ gauge, which reduced weight.

advantages: Ability of Polyflex to conform closely to the contours of the other section provided a more leak-proof assembly. In addition, Polyflex will not warp, twist or shrink in refrigerator temperatures. Water absorption is nil.

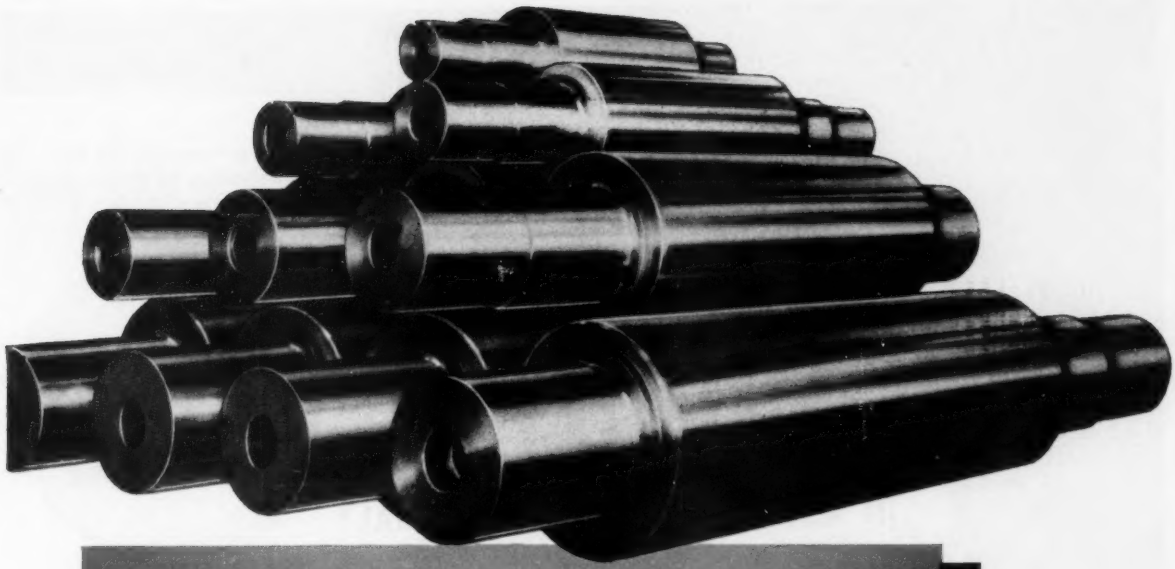
Tough, versatile Polyflex is doing things no other sheet plastic can do. Why not write us for complete information?

***NOSCO PLASTICS,** division of National Organ Supply Co., Erie, Pa., is the molder who worked out this Polyflex application.*

PLAX

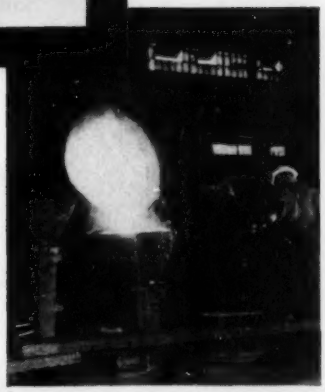
PLAX CORPORATION

WEST HARTFORD 1, CONNECTICUT



TO BE *SURE*

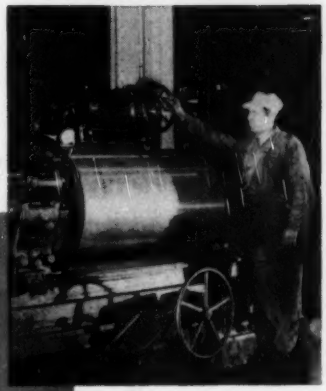
WE MAKE OUR OWN ROLLS



Physical and metallurgical properties of rubber or plastics processing rolls frequently need to be varied to meet special conditions peculiar to the nature of the work to be performed and the requirements of the finished product. That's why the rolls used in Adamson United equipment are custom designed to their specific functions by our own engineers and carefully controlled through every step of manufacture from metallurgical composition to final machining and polishing, in our own roll shops. We have found this precision-minded policy—typical of every phase of Adamson United manufacture—to be our best assurance of customer satisfaction.

Our engineering abilities and plant facilities are available to the industry for the design, construction and installation of all types of rubber or plastics processing equipment.

We invite your correspondence.



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730 CARROLL STREET · AKRON 4, OHIO

Branch Offices located in Principal Cities

Subsidiary of United [illegible] and Foundry Company · Plants at Pittsburgh, Woodsfield, New Castle, Youngstown, Canton

Here are examples of the wide variety of Sylvania-molded parts available.

QUALITY- MOLDED PARTS

IN ANY DESIGN... ANY MATERIAL!

Sylvania's modern plastic plant offers a wide range of facilities for molding and finishing both thermosetting and thermoplastic materials. Fully automatic and semi-automatic injection and compression type molding presses, supplemented by engineering "know-how," enable Sylvania to produce your product economically . . . to your complete satisfaction.

Our plastic engineering staff is at your service for the development or improvement of products for use outside, as well as within, the electronics and lighting industries.

Give Sylvania the opportunity to quote your molded plastic parts requirements. A line on your letterhead will bring you further information you desire. Write to Sylvania, Dept. 4A-2403, at the address shown below.

YOU CAN'T BEAT SYLVANIA FOR QUALITY AND ECONOMY!

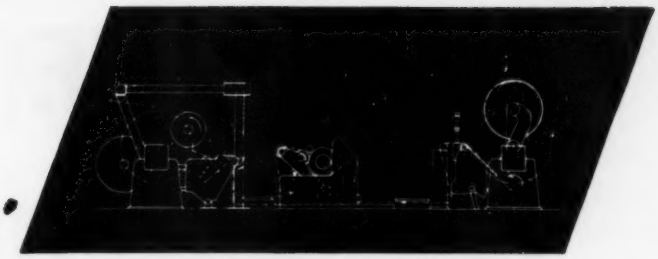
LIGHTING • RADIO • ELECTRONICS • TELEVISION

SYLVANIA

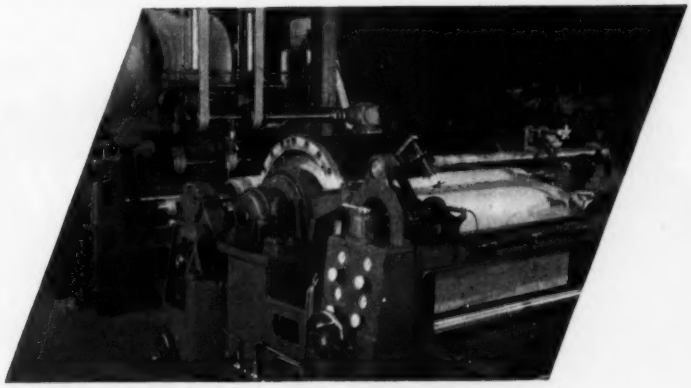
Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

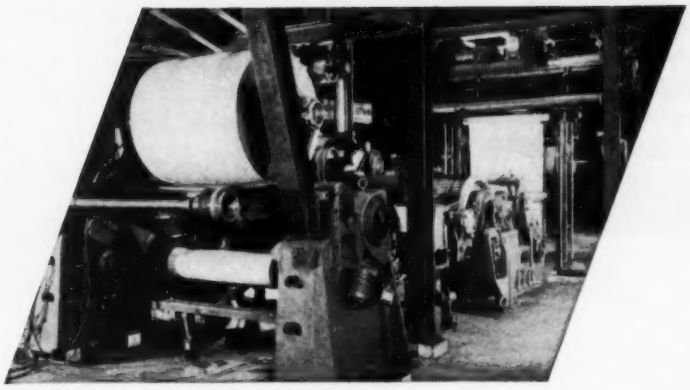
In Canada: Sylvania Electric (Canada) Ltd., University Tower Bldg., St. Catherine St., Montreal, P. Q.

You buy experience...



WITH DILTS POLYETHYLENE EXTRUSION LAMINATOR





You buy...

The experience of the leading converters who offered their ideas and data to provide the optimum operating features in the laminator.

The experience of the leading extruder manufacturer whose equipment Dilts includes to provide you with a complete package installation.

The experience of Dilts—designers of high speed converting machinery and experts in continuous unwinding and winding equipment which is so essential to successful production on Polyethylene laminators.

Model PL-1000 shown for operation to 1000 FPM; also available, Model PL-400 for operation to 400 FPM. Write for further details.

Dilts

THE BLACK CLAWSON COMPANY
DILTS MACHINE WORKS DIVISION
FULTON, NEW YORK

PROTECTIVE COATINGS with outstanding

Firestone EXON 470 combines the properties of many resins!

- EXCELLENT SOLUBILITY IN METHYL ETHYL KETONE
- HIGH DEGREE OF SOLUBILITY IN AROMATIC HYDROCARBONS
- ADHESION TO METALS
- ADHESION TO ALKYD SURFACES
- ALKYD COMPATABILITY
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- EXCELLENT PIGMENT DISPERSION PROPERTIES

Newest addition to Firestone's family of resins is EXON 470... Its possibilities and opportunities for protective coatings have been developed by exhaustive research.

It combines the best properties of many resins used in this field—giving you greater-than-ever efficiency and economy of production. It helps you deliver a better-performing product through the use of one rather than a combination of several resins that protective coatings previously required.

Review the unprecedented combination of properties EXON 470 provides listed above.

From Firestone's laboratories have come a succession of new and important resins for innumerable applications and industries. More will be announced . . . because Firestone resin research is producing an ever-growing EXON line, bringing industry shorter cuts to finer products.

get a brand NEW resin solution characteristics!

Firestone EXON 470

NOT TO MENTION . . . abrasion resistance . . . acid resistance . . . alkali resistance . . . fast baking . . . medium fast drying . . . flexibility . . . oil and grease resistance . . . outdoor durability . . . salt-spray resistance . . . water resistance . . . low moisture vapor permeability.

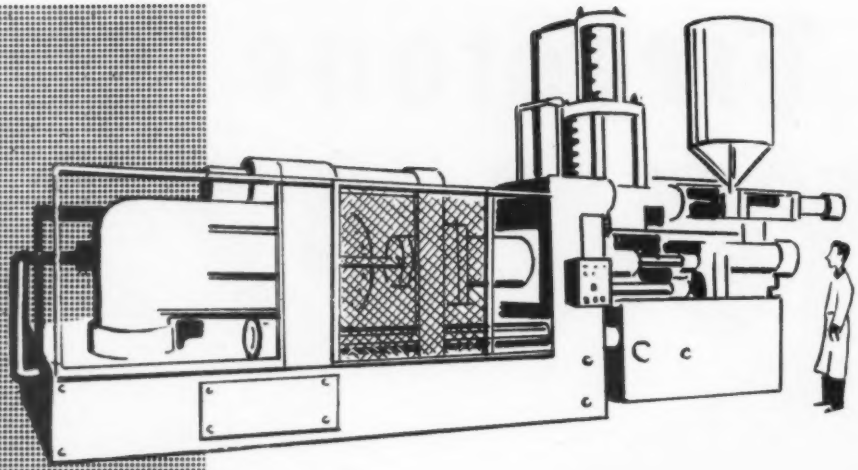
For complete information or technical service write or phone

CHEMICAL SALES DIVISION

Firestone Plastics Company, Dept. 22B, Pottstown, Pa.

Division of The Firestone Tire & Rubber Co.

CAPACITY

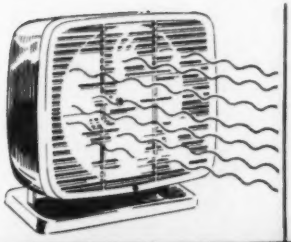


. . . for the ultimate in PLASTIC MOLDING

We have added a new giant injection molding machine to our already complete facilities in order to offer our customers *everything* necessary for finest plastic molding. The new machine has a capacity of 200 ounces and can handle large area moldings with amazing new speed.

If your molding program includes heavy sections with large projected areas, why not check with us. We have the answer to *all* your molding needs.

BPM Bridgeport Moulded Products, Inc.
Bridgeport 5, Connecticut



They needed a plastic that was light weight, attractively finished and dimensionally stable.

Molder, Prolon Plastics, Florence, Mass.

KOPPERS POLYSTYRENES

Type 3	General Purpose Polystyrene
Type 7	Improved Heat Distortion Temperature
Type 8	Highest Heat Distortion Temperature
MC-185	High Impact, Lowest Water Absorption Rate
MC-301	High Impact, Improved Heat Distortion Temperature
MC-305	High Impact, Easy Flow
MC-309	High Impact, Highest Heat Distortion
MC-401	Medium Impact, Improved Heat Distortion Temperature
MC-405	Medium Impact, Easy Flow
MC-409	Medium Impact, Highest Heat Distortion Temperature

HERE is a G.E. All-Purpose Portable Fan, winner of the Home Safety, Home Fashion and Industrial Design Awards. The plastic housing is light weight, attractively colored and smoothly finished for easy cleaning. And because of its dimensional stability, Koppers Polystyrene 31 permits an exact fit of the housing and grill.

Whatever your plastic requirements you can depend on Koppers Polystyrene. Koppers makes ten types of polystyrenes, each one for a specific job. If you would like to get qualified engineering advice about the specific Koppers Polystyrene that will help make your product better and help you lower your production costs, call or write your nearest Koppers Office.

Color requirements?

Koppers booklet "Color in Plastics" shows how the science of color engineering is used in the manufacture of Koppers Polystyrenes. Write for your free copy today.

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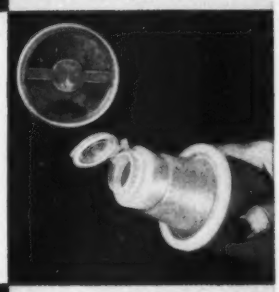

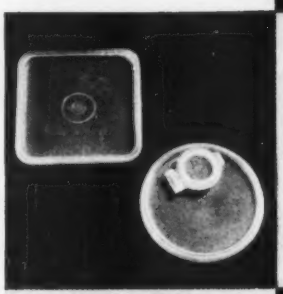

Tupper Seals are air and liquid-tight flexible covers. The famous Pour All and Per Top covers are designed for easy dispensing. They are made in sizes to fit all Tupperware containers.

The logical molder for you to consult regarding that product or package of yours which is to be made of polyethylene is Tupper. Tupper has done more than any other molder to make molded polyethylene a practical reality.

Aside from having designed, patented, and promoted successful seals, closures, and dispensers for polyethylene containers, the Tupper Corporation has vast experience in *every phase* of polyethylene packaging and polyethylene injection molding. This experience will be of major importance in improving your product, in reducing your costs, when Tupper goes to work for you.

Tupper's combination of experience, technical ingenuity, and the most modern equipment is at your service for the custom molding of your product in polyethylene. You can do no better than the best ...and the best at molding polyethylene is Tupper!

When equipped with Tupper Seals, Tupper Canisters, Sauce Dishes, Wonder Bowls, Cereal Bowls and Funnels in various sizes are the most versatile reusable containers you have ever seen.

TUPPER!
TRADE MARK

TUPPER PRODUCTS ARE FULLY PROTECTED

About 150 United States and foreign patents and patents applied for, plus numerous trademarks and copyrights, cover the design and manufacture of the various types of Tupper Seals and other Tupper Products. Unauthorized manufacture of items covered by Tupper patents will subject infringers to prosecution.

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LARGE CAPACITY

Thermatron P-16 Press

Especially designed for sealing large bulky products such as wading pools, life rafts, oversize inflatable toys and the like, the brand new Thermatron P-16 Press is available with bed sizes up to 25″ x 60″. It's big in convenience, too. There's access to the press on three *sides* . . . And P-16 is absolutely rigid as a machinist understands the word. That means top accuracy. The press can be equipped with indexed turntables if desired.

To power the heavy P-16, big Thermatron high frequency generators 6 KW to 20 KW are available from stock. Custom-built up to 100 KW!

The majority of high frequency generators and presses in use throughout the world by plastics fabricators are *Thermatron* equipment . . . So benefit by Thermatron research and experience: Whatever you fabricate in plastic, whether large, small or in-between, let us make your sealing problems ours! Write or phone for complete information now—and request Bulletin 81.

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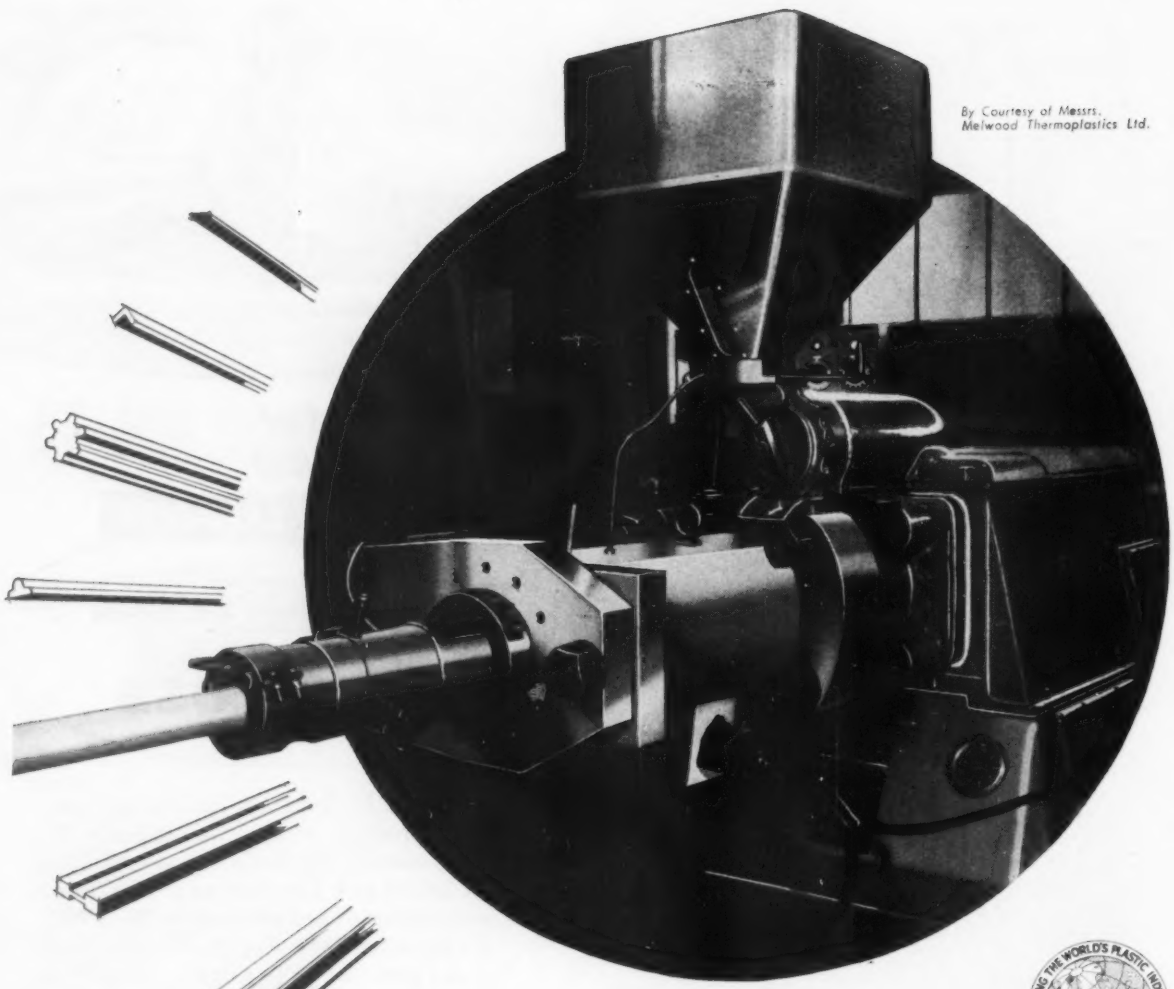
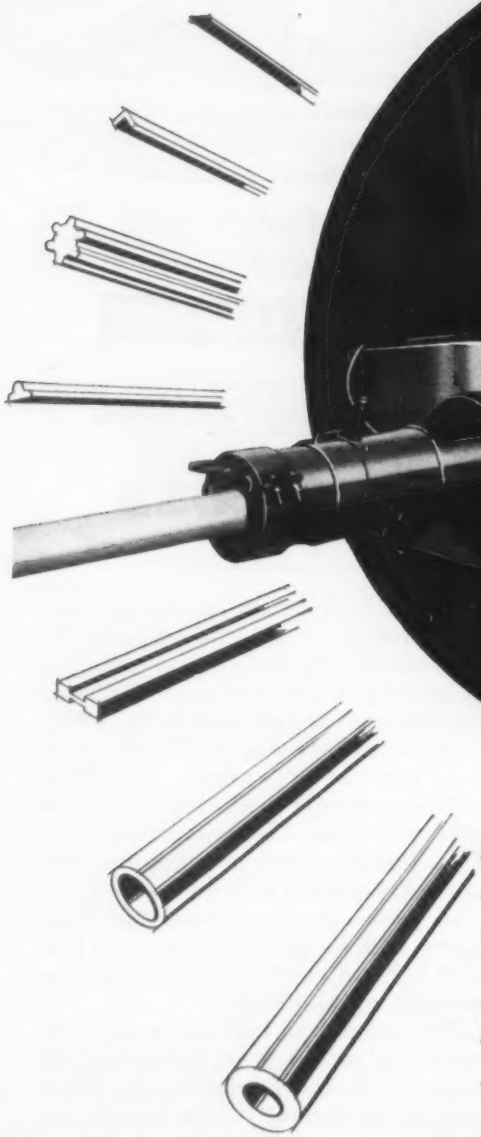
Thermatron DIVISION



By Courtesy of Messrs. Melwood Thermoplastics Ltd.



ADVANCES in EXTRUSION

The most recent installation is the Windsor R.C.100 extrusion machine. It has been installed at the works of Messrs. Melwood Thermoplastics Ltd., of Harpenden, England.

The tubes produced are of 3" diameter with a wall thickness of ¼".

The material used is completely unplasticised P.V.C. Melwood's hope to make 6" and 8" tubes of a special material later in the year. Subsequently tubes of even greater diameter will be made. One of the materials extruded is Tenite II in fluted rod form for screw driver handles.

Write for descriptive literature.

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A Modern Labor Saver

successfully molded & assembled by

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PATENTS PENDING

A QUICK PRESS of the button and the ingenious "Jet Brush" dishwasher shoots a jet of liquid detergent from the reservoir inside its hollow handle. Conveniently combining a scraper and a handy brush, it makes dishwashing and other household chores easier and faster.

When I. J. Moritt Products Co., Inc., Chrysler Bldg., N. Y., first brought the project to Ideal, it was far too complex for economical production. Ideal's engineers pitched in to iron out design problems and to guarantee the efficient operation of the complicated mechanism. They specified high impact styrene as the basic material. Now Ideal injection molds the components, assembles them with the brush units, inspects . . . packages . . . ships.

Companies who will settle for nothing but the highest grade workmanship and service turn to Ideal for their custom injection molding requirements. Full information about what we can do for you will be supplied by A. C. Manovill, Vice President in Charge of Sales, Ideal Plastics Corporation, 184-10 Jamaica Ave., Hollis 7, N. Y. Phone: AXtel 7-7000.

Better Molded Plastics Ideal *for Industry & Home*

You saw this ad in Tool Engineer, Machinery, Modern Machine Shop, American Machinist, Iron Age.

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You profit because mold steels are tool steels at Crucible. Our reputation as specialty steel leaders was built with tool steels.

That means you get all the experience of more than half a century of tool steel leadership when you buy mold steel from Crucible.

Crucible mold steel *is* better—because it's tool steel. And you'll find mold steel stock in strategically located warehouses from coast-to-coast.

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Get your copy of the unique Crucible Tool Steel Selector — a quick twist of the dial gives you the right tool steel for the right job. And the selector picks mold steel, tool 9-inch diameter; printed in 3-colors.

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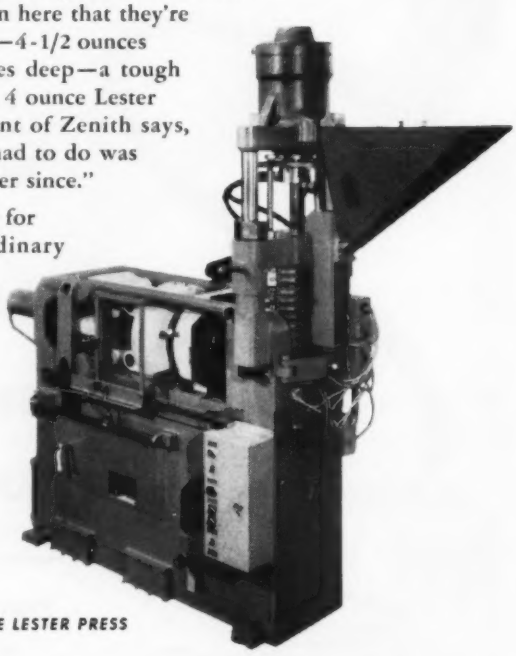
AVAILABLE IN UNITS to COLOR 50 OR 100 LBS.

GERING *Products Inc.*
KENILWORTH, N. J.

4½ ounces from a 4 oz. LESTER

At ZENITH PLASTICS in Cleveland, they like the L-1/2-4 ounce Lester. It's small wonder when you examine the part shown here that they're running on the 4. It's a vacuum cleaner motor guard—4-1/2 ounces of acetate, 10-1/8 inches in diameter, about 2 inches deep—a tough job to fill without showing weld marks. But on the 4 ounce Lester they do it easily. As Paul Zurlinden, Vice-President of Zenith says, "We're delighted with the 4 ounce Lester. All we had to do was install it and it started running—and it has been ever since."

Here is the Lester machine that is offered especially for *fully automatic molding* of small shots at extraordinary production rates, or its full rated capacity at competitive cycles. The Zenith part clearly shows the extra capacity built into all the new Lester equipment. Besides, the cut-off attachment for molding nylon is standard on this machine.



Yes, day-in, day-out, trouble-free performance in one plant after another is the experience of satisfied Lester users. If you want to check complete specifications, write to Lester-Phoenix or the representative in your area listed below.

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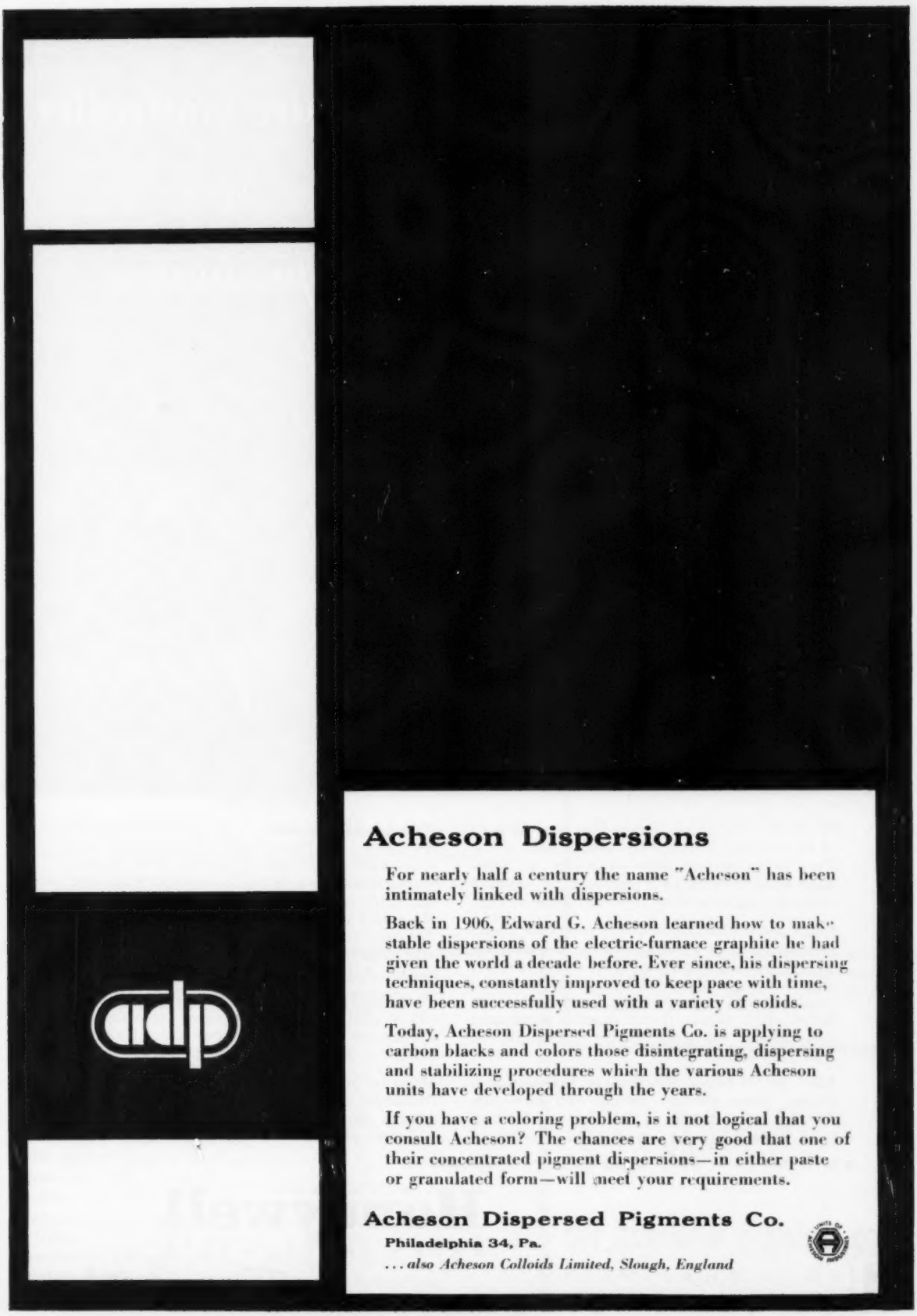


Acheson Dispersions

For nearly half a century the name "Acheson" has been intimately linked with dispersions.

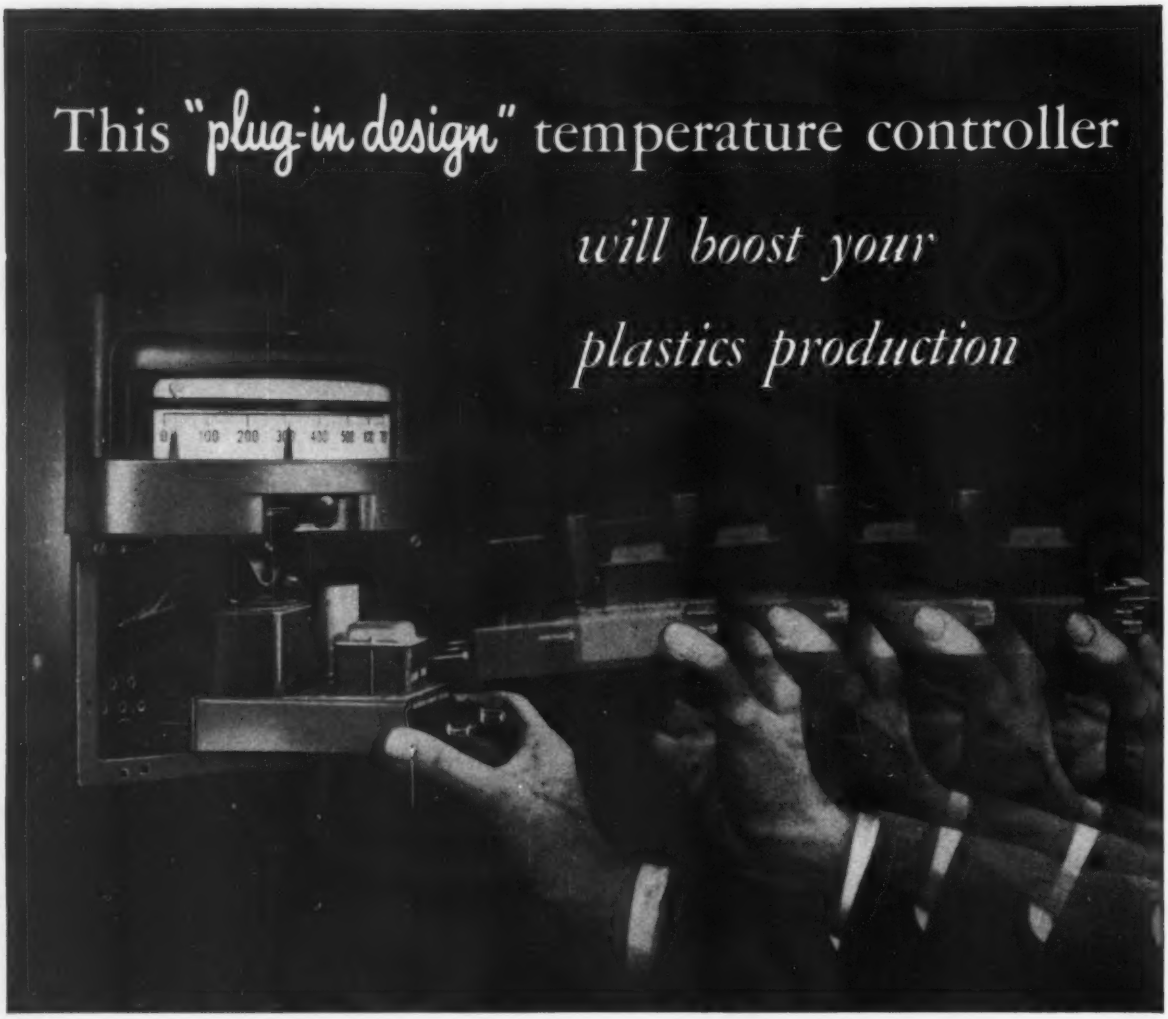
Back in 1906, Edward G. Acheson learned how to make stable dispersions of the electric-furnace graphite he had given the world a decade before. Ever since, his dispersing techniques, constantly improved to keep pace with time, have been successfully used with a variety of solids.

Today, Acheson Dispersed Pigments Co. is applying to carbon blacks and colors those disintegrating, dispersing and stabilizing procedures which the various Acheson units have developed through the years.

If you have a coloring problem, is it not logical that you consult Acheson? The chances are very good that one of their concentrated pigment dispersions—in either paste or granulated form—will meet your requirements.

Acheson Dispersed Pigments Co.
Philadelphia 34, Pa.
... also Acheson Colloids Limited, Slough, England

This "plug-in design" temperature controller *will boost your plastics production*



THE PICTURE above shows how easy it is to interchange a complete control unit of the *Pyr-O-Vane* temperature controller. It takes only *seconds*—and your extruder or molding press never gets tied up for instrument service.

Simplified maintenance is only one of the many benefits that you get from the *Pyr-O-Vane* controller. Equally important is its ability to hold critical temperatures with the hair-splitting precision that pays you big dividends . . . in faster cycle times, fewer rejects, accurately dimensioned moldings, better uniformity of color and finish.

Ideal for all types of extruders, injection machines, press platens, molds, and dies—the *Pyr-O-Vane* controller is available as a contact type instrument for on-off, two-position or three-position control . . . or as a proportional controller—the Pulse *Pyr-O-Vane*—which provides time-proportioning action. The control units are complete, plug-in components that can be readily interchanged depending on the type of control required for a specific application. The galvanometer unit, with its indicating scale, also plugs in; range changing becomes a simple matter of inserting a different unit.

Your local Honeywell engineering representative will be glad to discuss how these versatile controllers can go to work in your plant. Call him today . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4437 Wayne Ave., Philadelphia 44, Pa. Service centers in more than 90 principal cities.

● **REFERENCE DATA: Write for Catalog 1053 on "*Pyr-O-Vane* Controllers."**

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Leading heat and light stabilizer for clear or opaque stock, an organic liquid complex containing no disadvantageous soapy component. Unequalled for stabilizing against effects of sunlight or outdoor aging.

BARIUM-CADMIUM
128 — V — 5

Leading combination of coprecipitated laurates for outstanding performance, where lubricating advantages are required. Generally 30% more effective than common barium-cadmium laurates.

Stabilizing Systems developed for Harshaw Customers, for special processing and finished product properties, may contain one of the following eleven stabilizers.

ZINC 9-V-1: Organic liquid complex containing no disadvantageous soapy component, used in selected formulations.

CADMIUM 24-V-1: Organic liquid complex for highest attainable clarity, used principally with dispersion resins.

CADMIUM 2-V-8: Selected laurate, used principally with low fusing resins.

BA-CD 12-V-5: Coprecipitated laurate.

ORGANIC 7-V-1: Epoxy assistant, modification of 7-V-2.

ORGANIC 8-V-3: Useful with particularly sensitive organic colors.

BARIUM 1-V-1: Modified ricinoleate, used in a few organosol formulations.

BARIUM 1-V-3: Dispersible stearate, to contribute lubricity with barium effects.

CADMIUM 2-V-5: Dispersible stearate, to contribute lubricity with cadmium effects.

CALCIUM 5-V-1: Dispersible stearate, to contribute lubricity with calcium effects.

CALCIUM 5-V-2: Low melting stearate, to reduce internal friction effects.

Best effects are attained for particular requirements by combining 2-V-4 or 128-V-5 in a stabilizing system with one or more of the following three stabilizers.

BARIUM
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Compatible barium compound, minimum effect on viscosity. Permits processing at higher temperatures.

ORGANIC
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Epoxy assistant, highly effective HCl-scrubbing agent, undiluted. Will extend stability for longer processing periods.

ORGANIC
8-V-1

Chelating agent, more than two times as effective as common organic phosphites. Inactivates harmful by-products to boost stability. Contributes to top clarity.

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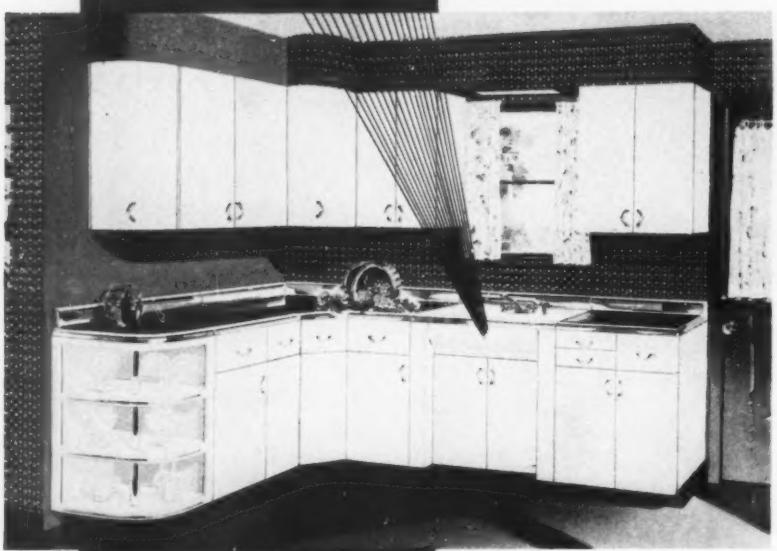
A Jeweled Trademark *that Sparkles* many a *Youngstown Kitchen*



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The Mullins Manufacturing Company has identified their new Diana Ensemble Youngstown Kitchen sinks with a rich medallion depicting the Roman goddess, Diana, in gold relief against a striking ruby-red background framed in gleaming chrome.

ERIE Three-Dimensional Plastics name plates and trademarks identify many nationally famous products. For execution of your ideas, or for help in formulating them, come to **ERIE** . . . the pioneer in custom injection molded plastics.

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TYPICAL PROPERTIES

- Weight loss of castings:
  After 168 hrs. at 392°F 2-3%
  After 720 hrs. at 392°F ... 13-15%
- Flexural strength retention of glass cloth laminates:
  After 168 hrs. at 392°F .. up to 90%
  After 720 hrs. water immersion 92%
- Shrinkage during curing.....5%
- ASTM heat distortion point of castings ..... 212-220°F
- Electrical properties of castings at 10^9 cycles:
  Dielectric constant 2.85
  Power factor ..... .00575
  Loss factor ..... .0164

FOR COMPLETE INFORMATION on HETRON resins, send today for technical data sheets listing properties of the liquid resins, cured unfilled resins, and glass cloth laminates. Includes general handling and curing recommendations, and other useful information.

In HETRON, a new family of self-extinguishing resins, you will find *in full measure* all the properties a good fire-resistant polyester should have.

Heat resistance, in particular, is outstanding. Castings aged at 200°C lost only 2% of weight in seven days (as compared with 10% or more for standard non-fire-resistant resins, and up to 20% for ordinary fire-resistant resins).

Glass cloth laminates aged at 200°C for seven days retained up to 90% of their room temperature flexural strength. Fire resistance was virtually unchanged in the same period.

HETRON resins are self-extinguishing even without the use of additives, because they contain 30% chemically-bound chlorine. At the same time, they are clear and stable. Where even higher fire resistance is desired, addition of 5% antimony trioxide results in laminates that will not support a flame for one second, even after five repeated applications of a Bunsen flame.

Transmission of water vapor through HETRON resins is very low, compared to standard resins—so low that it is difficult to measure accurately. Absorption of water is also lower. For these reasons, electrical properties of the resins are much less affected by long exposure to high humidities and elevated temperatures than ordinary polyesters.

Shrinkage-on-cure of less than 5% by volume, and little or no air inhibition, are important advantages of the new resins. Resistance to acids is better than that of standard resins. Heat distortion temperatures are better than with many standard polyesters.

HETRON resins are light-colored, transparent viscous liquids. At present, they are available in drum quantities.

The facilities of our laboratories are available to cooperate with you in the application of HETRON polyester resins.

From the Salt of the Earth

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Polyethylene PERMACOUNTERS*

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- 100% utilizable

Adds profit-making sales appeal, increases service value of any shoe.

*Endicott-Johnson Pat. Pending

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3. Provide quick-change of molds for many different sizes
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5. Hold all molding variables within close tolerances
6. Hold full production pace hour after hour, shift after shift, day after day.

For Machine Information on high speed and automatic molding, write, wire or phone the nearest Fellows Sales Office.

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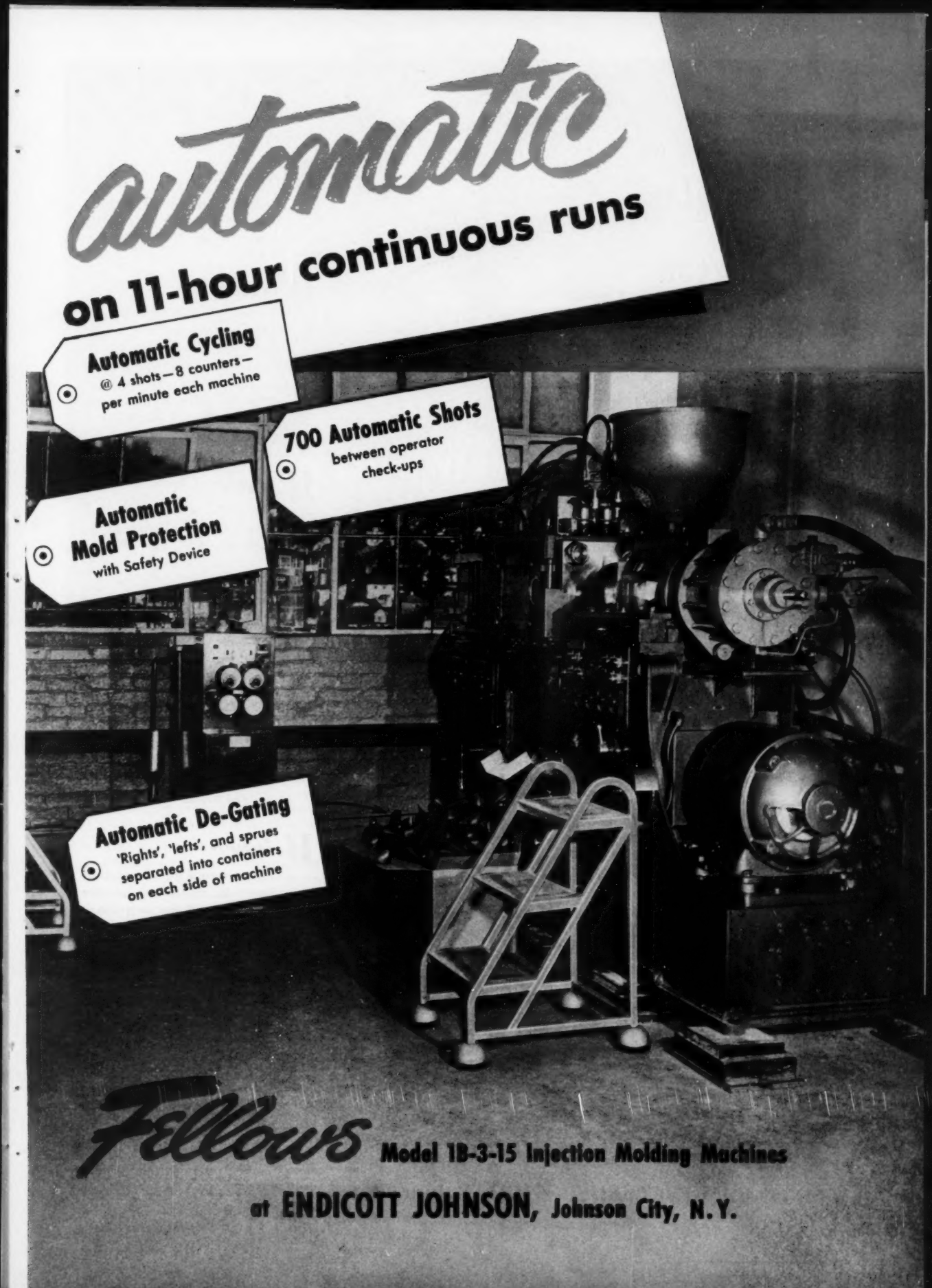
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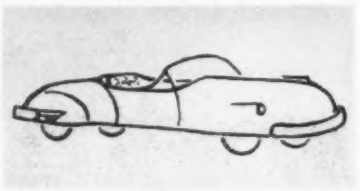

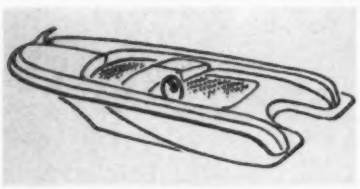

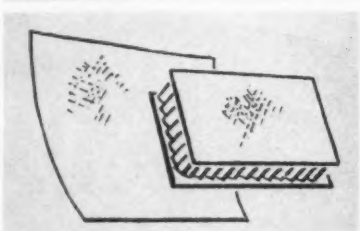

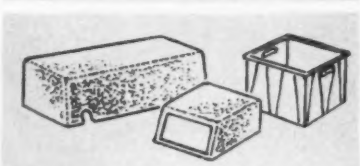

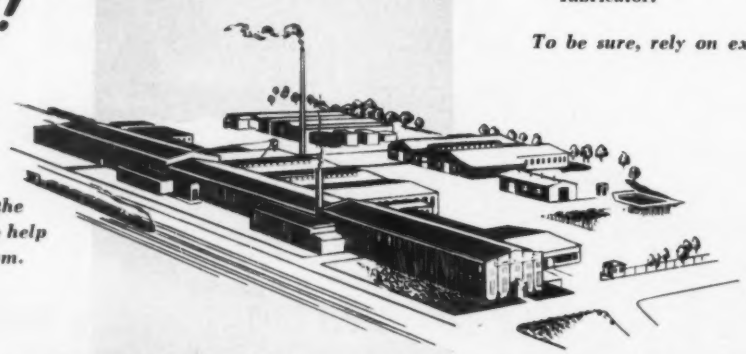

Winner's technical staff has the know-how and experience to help solve your fabrication problem. Why not consult them?

Winner **is the pioneer in the development and production of Fiberglas reinforced plastic parts.**

Winner **has one of the largest staffs of experienced engineers in the industry. We maintain one of the best equipped laboratories in the country and devote 80,000 square feet of floor space to Fiberglas reinforced plastic fabrication.**

Winner **has molded a larger variety of parts — from a 3″ wave guide window to a 35′ boat hull.**

Winner **is one of the country's largest users of Fiberglas and resin molding materials.**

Winner **has pressure-bag molded more large parts and, in addition, has the best equipment for mass production of press-molded items.**

Winner **has a record of accomplishment in reinforced plastics unsurpassed by any other fabricator.**

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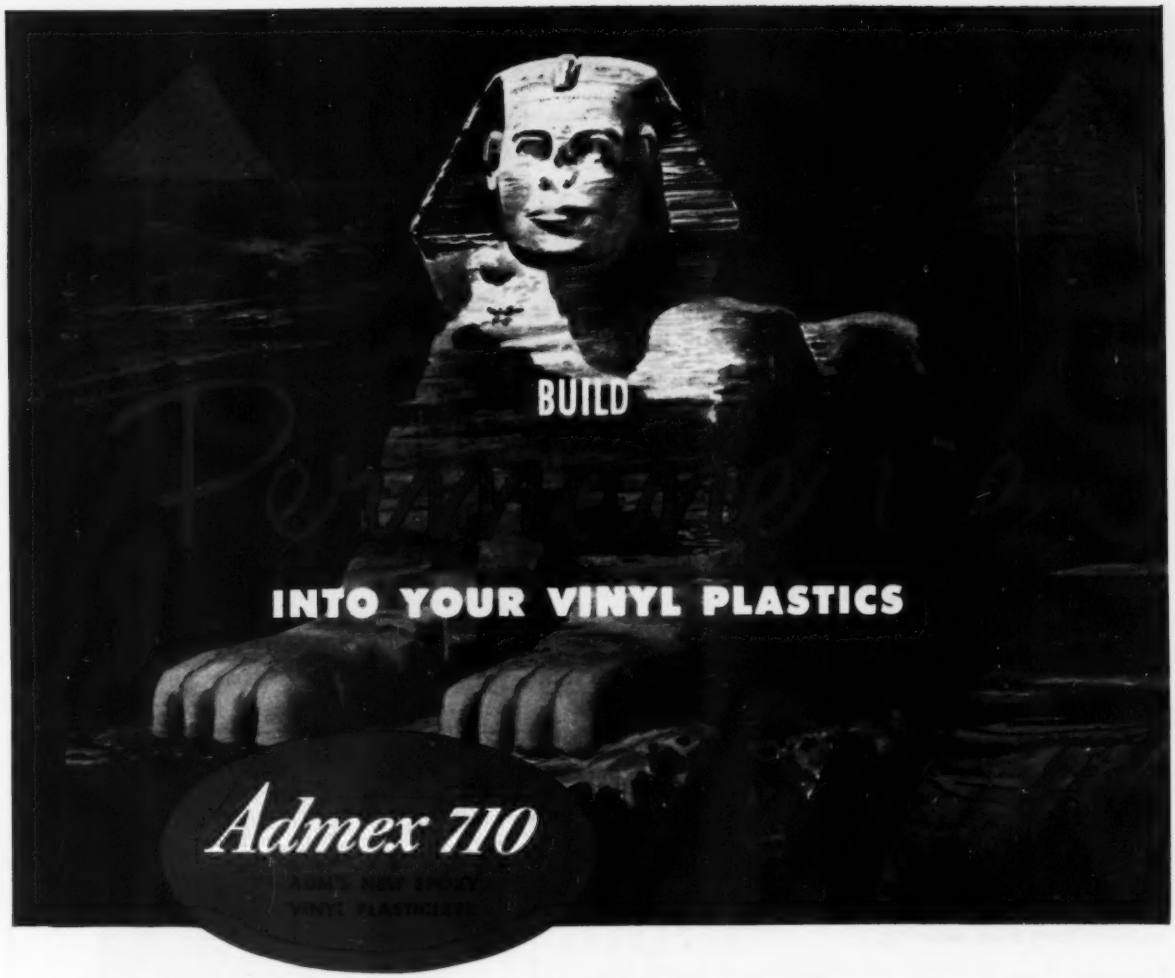

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Send today for technical bulletin and evaluation samples. See for yourself how *Admex 710* can help improve your products, increase customer satisfaction, and—at the same time—lower your production costs!

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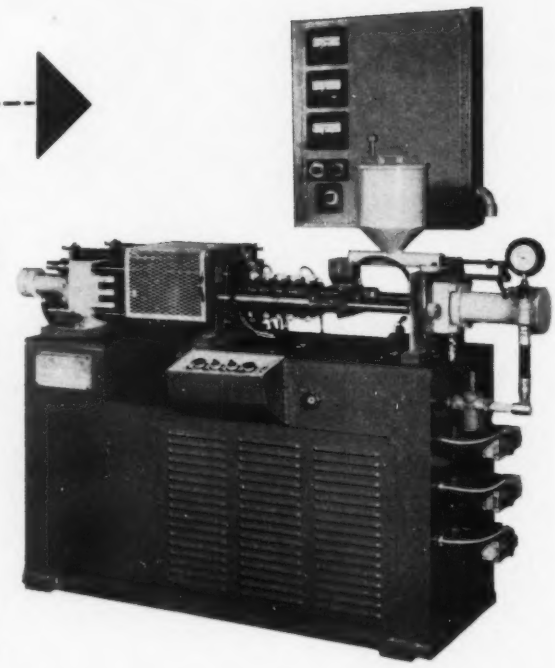
MOSLO MODEL 73 ..Two Ounce.. PLASTIC INJECTION MOLDING MACHINE

★ High Speed—1200 Shots Per Hour

★ Completely Automatic

★ Hydraulic Operated



★ Here is the answer to high-speed injection molding at a low mold cost. The Moslo Model 73 is a sensational, all-new, plastic molding machine—revolutionary in design, outstanding in performance. It incorporates the most recent engineering advancements in completely automatic injection molding. Rated at 1200 cycles per hour (dry run) it will shoot a full two ounce shot. The Model 73 is comprised of two separate units—the beautiful, compact machine and a sturdy, easily accessible, wall mounted control cabinet. Ideal for long runs of small pieces at high speed operation, plus small mold cost, the Model 73 is just the machine that custom molders have been wanting.

Compare these features, investigate, and you'll buy!

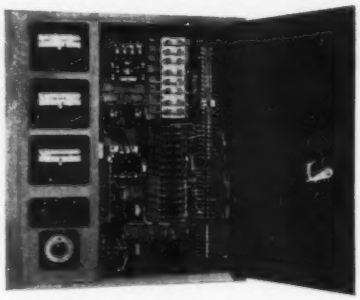
THE MODEL 73 MOLDING MACHINE FEATURES . . .

- Horizontal Construction
- Four tie rods with micrometer adjusting nuts for even distribution of pressure on four points of toggle clamp
- Welded base of heavy-gauge steel
- 45 gallon oil tank
- 5 H.P. motor
- Vickers hydraulic pump and heavy-duty oil heat exchanger
- Two pressure hydraulic system so if part is not ejected machine shuts down without damaging mold
- 25 pound per hour plasticizing capacity
- Adjustable control injection speed
- 14 pound capacity metered-type hopper
- 8 x 9 inch DME mold blanks are employed
- 20 square inch *plus* molding area
- Water-cooled injection piston plus top half of material receiving funnel
- Even heat distribution and flow of material obtained with Moslo 'Radee' torpedoless stainless-steel material cylinder
- Cushioned hydraulic action at end of the forward and reverse strokes of clamping cylinder—parts ejected gently
- When safety gate is open, mold automatically opens—protecting operator and mold
- Push button panel on machine contains automatic and manual controls

Both the control panel and machine are shipped complete and ready for immediate installation.

The Model 73 is manufactured entirely in the United States using standard electrical equipment and controls that are readily serviced in major cities.

The Model 73 Control Panel Features . . .



- Independently fused circuits for all controls, the motor, and the heating cylinder
- All wiring is color-coded and properly marked
- 3 West Instrument Company Gardsman proportioning instruments: one controls rear heat, one controls front heat, and one controls nozzle temperature
- Four timers for controlling the time cycle, one Cycle-Flex timer for over-all cycle, one Cycle-Flex timer for first injection stroke, one Micro-Flex Counter timer for stuffing and one Allen-Bradley Repeat Cycle timer for fully automatic operation.

PLACE YOUR ORDER NOW FOR EARLY DELIVERY

MOSLO MACHINERY COMPANY

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—an antioxidant with an outstanding record of successful application

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The excellent chemical and physical properties of Ionol recommend its general use in polyethylene, cellulose based plastics, high molecular weight hydrocarbons and other polymeric materials where oxidation is undesirable.

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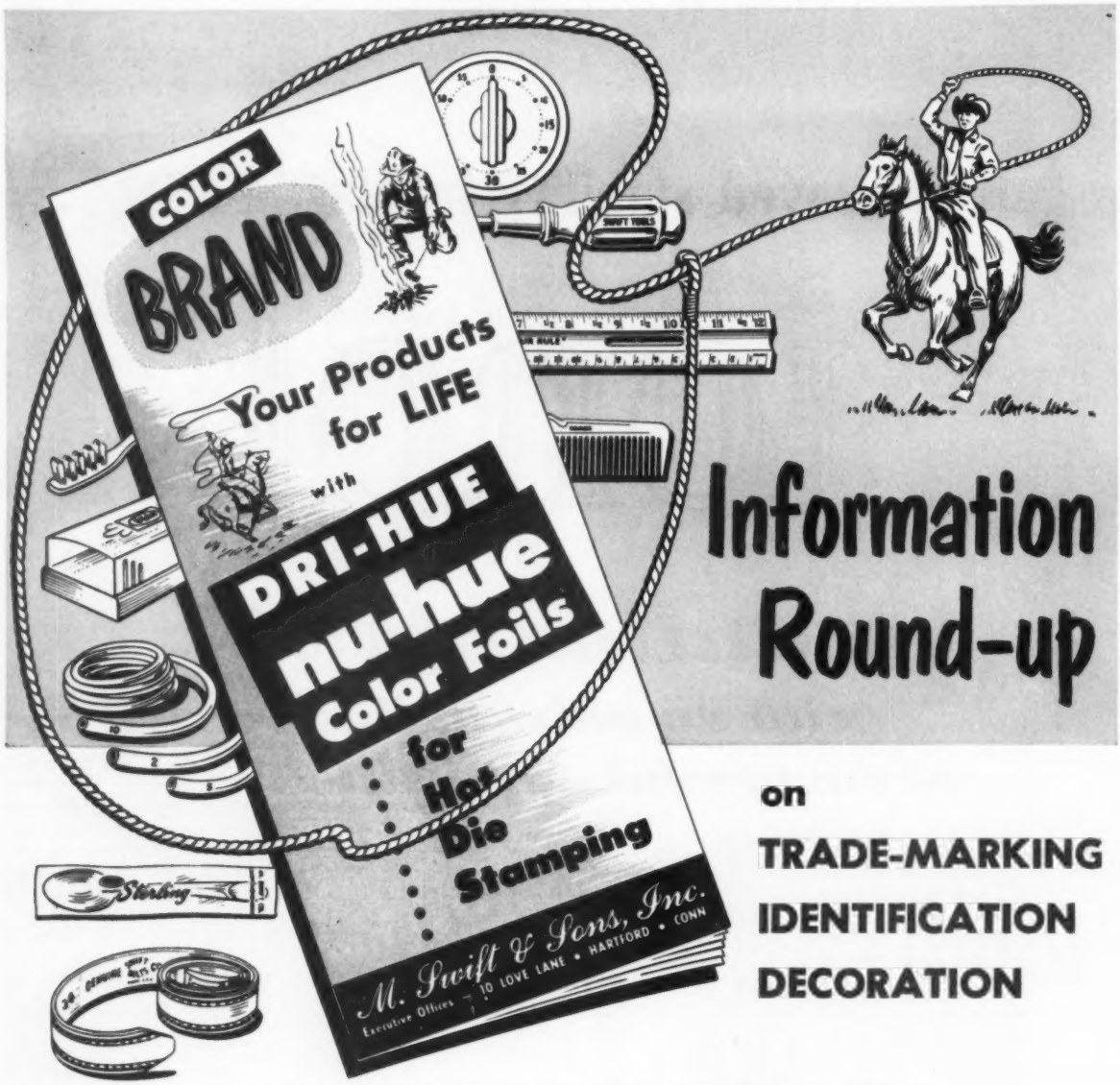

Information Round-up

on TRADE-MARKING IDENTIFICATION DECORATION

Get the facts about Swift Nu-Hue and Dri-Hue. This 16-page illustrated booklet tells the whole story about these specialized color foils. Contains everything you need to know about application . . . equipment . . . operating temperatures . . . plus Swift *free* Laboratory Service. Evaluate the advantages of this Swift color branding process yourself . . .

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We particularly recommend:

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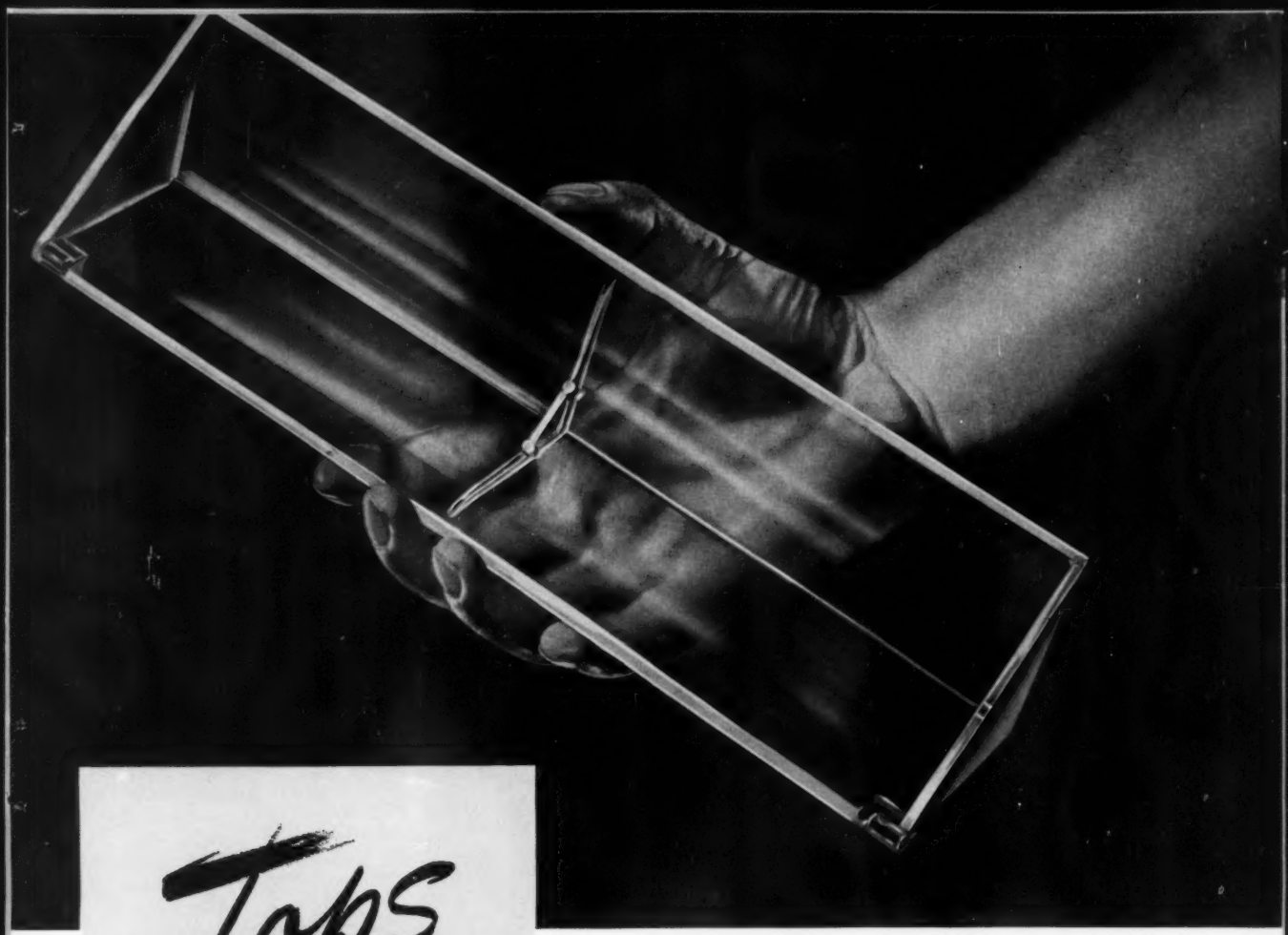

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Polystyrene gable molded for Precision Scientific Co., Chicago, builders of laboratory equipment.

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10 specific design features of FOREMOST

- no fly-back of material from hopper, no leakage anywhere.
- quickest and easiest to clean, low in maintenance cost.
- no wrenches required to remove hopper or screen.
- no jamming when fed hot sprues with hardened material.
- Special arrangement for feeding extra long sprues.
- convenient material bin supplied with cutter.
- unique double shear knives cut soft plastics easily.
- all steel construction.
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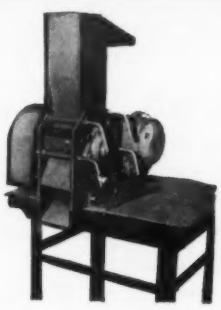
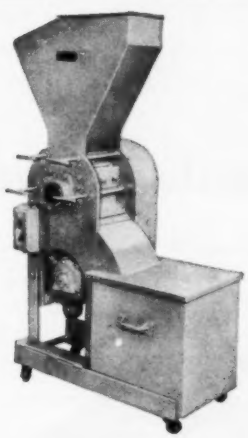


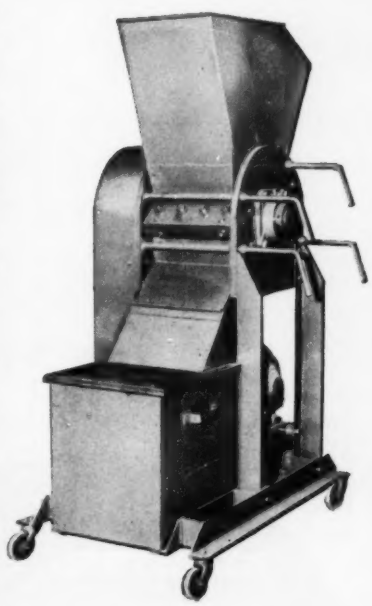
Model 1A (½ HP)

Bench model recommended for laboratory use, or beside small injection presses. Available with or without material bin. Single phase, 110/220 volts. THROAT SIZE 3½" x 5".



MODEL 2A (1½ HP)

Floor model with casters. 250 units now in service throughout the U.S. Capacity ¼" screen — polystyrene material — 150 lbs. per hour. THROAT SIZE 4" x 8".



MODEL 3C (3 HP)

Floor model with casters. Excellent for heavy sprues or parts such as brush-backs. Recommended for beside large presses; can be used for batch grinding up to 300 lbs. per hour. THROAT SIZE 6" x 12".

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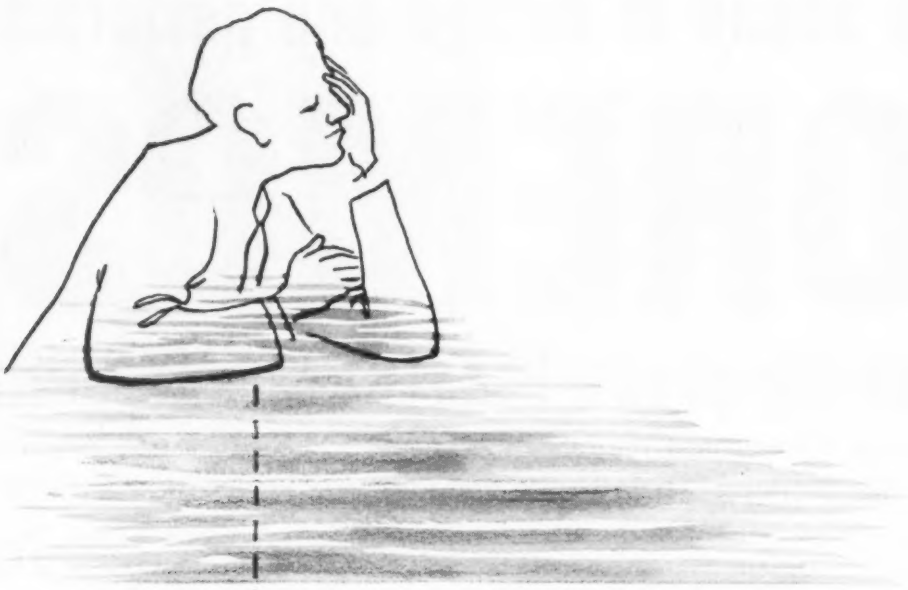

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One of these FOUR DESIGNS may be just THE LABORATORY MILL you need

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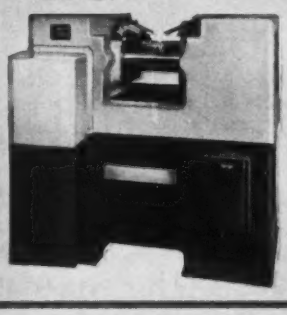
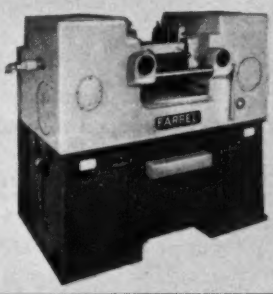
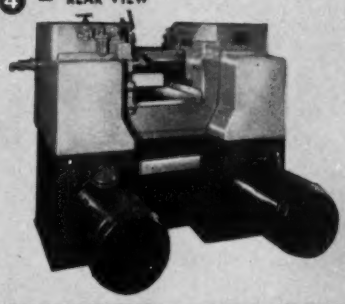
2 — REAR VIEW



3 — FRONT VIEW



4 — REAR VIEW



	Method of Speed Control	No. of Motors	HP Each Motor	Friction Ratio	Roll Speed (RPM) Front	Roll Speed (RPM) Back
1	Constant	1(AC)	7½	1.4:1	23.5	33
2	Vari-pitch Pulley	1(AC)	7½	1.4:1	13 to 24	18 to 34
3	Vari-pitch Pulleys	2(AC)	5	Variable	20 to 38	18 to 34
4	Variable Voltage	2(DC)	5	Variable	4.5 to 34	6 to 45

Here is a standard, two-roll, 6" x 13" laboratory mill, which you can have with four different drive arrangements. One of these should give you exactly the roll speed, or speeds, and friction ratio you need for your experimental work.

Drive may be (1) by single AC motor with mill gearing to give constant roll speed and 1.4:1 friction; (2) by single AC motor driving the rolls through vari-speed sheaves to give a back roll speed range of 18 to 34 RPM and 1.4:1 friction; (3) by two AC motors with vari-speed drives for friction ratios from even speed up to 2.1:1; (4) by two DC motors with variable voltage control for ratios from even speed up to 10:1 friction.

Standard mills have self-contained automatic cascade lubrication, swinging scraper, tilting guides and knee-operated safety trip. Optional features include chrome-plated rolls, extra hand scraper, air-operated scraper, ratchet roll adjustment, and batch-off roll.

Send for further information about this versatile mill. Or, if you prefer, a Farrel-Birmingham engineer will be glad to discuss your laboratory equipment problems with you at any time.

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Watson-Standard Vinyl Plastisols and Rigidsols have been used with both slush molding and dip molding. Such items as doll and doll parts, toys, spark plug covers, electrical components, novelties, puppets, toilet valves, boats, light sockets and others are illustrations of this type of application.

Dipping:

Watson-Standard Vinyl Organosols and Plastisols have been applied by dipping. Varied end products include dishwasher baskets, dish racks and drainers, electrical wiring, gloves, and springs for the automotive and upholstery industries.

Spreading:

Watson-Standard Vinyl Plastisols and Organosols may be spread coated. Coated textiles and paper are typical of this type of application.

Spraying:

Special foundations of Watson-Standard Vinyl Organosols and Plastisols may be applied by spraying. Finishes for metal furniture, cabinets and blowers are representative uses.

Casting:

Since Watson-Standard Vinyl Plastisols are in liquid form and may be readily poured, they lend themselves to casting. Casting applications include films, sealants for automotive and refrigeration industries, ceramic pipe joint threads, and potting compounds.

Troweling:

Watson-Standard Vinyl Plastisols may be formulated for troweling. This type of application lends itself to linings for tanks and sealants.

The Watson-Standard laboratories have formulated compounds for many end uses and methods of application. We will assist you with your problems.

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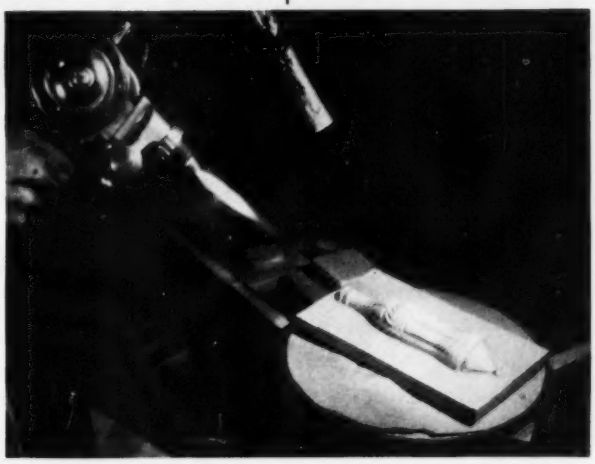
molds made in minutes

by fast, low-cost metallizing process

For low-pressure, vacuum, slush and lay-up molding.

Metallizing, the spraying of molten metal, is now being used for the production of molds for low-pressure, vacuum, slush and lay-up processes, in a wide range of mold sizes—some lay-up types as much as 30 feet long. These metal molds are made quickly, at low cost; masters may be of metal, cloth, wood, plastic, glass, or even wax. Finest detail is retained and mold life is practically indefinite. Part spoilage, "break-out" and patching or other maintenance on lay-up molds are eliminated; improved heat transfer, better curing, assure void-free parts.



Metallizing gun building up metal mold directly on plaster master

Finished mold. Note fine detail. Spraying time 28 minutes.

MODERN PLASTICS article describes method

The article, "SPRAYED METAL MOLDS," by *Dr. Walter Brenner* and *Leopold Hase*, of Brooklyn Polytechnic Institute, which appeared in the September MODERN PLASTICS, described the process in detail. We will be happy to send you a reprint of this article on request. Use the handy coupon.

METALLIZING ENGINEERING CO., INC.
38-14 30th Street LONG ISLAND CITY 1, N. Y.
In Great Britain: METALLIZING EQUIPMENT COMPANY, LTD. Chobham near Woking, England

Don K. Watson
METALLIZING ENGINEERING CO., INC.
38-14 30th Street
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☐ Please send me free reprint of MODERN PLASTICS article: "SPRAYED METAL MOLDS."

☐ Please have Metco Field Engineer call.

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Would you like to run an extra 5 cycles every hour on pieces like these?

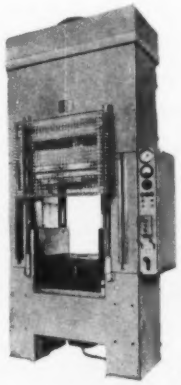
When you use Bipel downstroking prefiller presses, you earn a *production premium* every hour you operate. These high-efficiency presses really exhibit their value in the molding of small multiple cavity components where the cure is short and the open press time for stripping and reloading is relatively high.

All Bipel presses feature the patented "auto control" which, once set, reproduces even the most complicated molding cycle. The operator's judgment of timing never affects the cycle, which virtually *eliminates* rejects. The extremely fast clamp and transfer of Bipel presses increases production materially, with *better than average* tolerance control.

In addition to being less space consuming than conventional presses, Bipels are considerably less costly to install and to operate. They employ a unique line feed system with a single central power unit. One such unit, using inexpensive, trouble-free medium pressure which may be stepped up to higher pressure *at the press*, can drive as many as twelve Bipel presses.

Pressure may be used direct from the line (1:1), or may be doubled (2:1) or tripled (3:1) at will . . . the effect being three working pressures per press! A miniature of this drive may be built within the press frame for single press installations.

Space does not permit discussion of the many other advantages of using Bipel presses and power drives. Just write us and we will send you the complete facts.



Type 40	Type 100	Type 200
20, 40 or 60 tons	50, 100 or 200 tons	100, 200 or 300 tons

American inquiries should be sent to
Ralph B. Symons
Associates, Inc.
3571 Main Road
Tiverton,
Rhode Island

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B. I. P. ENGINEERING LTD.

Aldridge Road, Streetly, Staffordshire, England

FAMED NAMES
Rely on Amos

Yes—famed names in many industries rely on Amos . . . *injection molding and finishing specialists* . . . for their plastics requirements . . .

Because they know that Amos does their *entire* job right . . . accepts *full* responsibility for product design and engineering . . . mold building . . . molding with 4 to 300 ounce machine capacity . . . conveyorized assembly and finishing . . . vacuum plating . . . silk screening . . . hot stamping . . . roller coating . . . printing . . . spray painting—*everything* a product needs in plastics —under *one* roof—no divided responsibility.

Pictured herein are typical customer parts . . . utilizing *varied* Amos processes and skills to achieve *simple*, appealing beauty or *complex* decorative effects. All of these parts were molded of transparent materials with many of the multi-finishing operations on the *reverse* side to avoid scratching and marring in use.

We invite you to join the ever-growing list of Amos customers —*now*. No obligation . . . Write, Wire or Phone.

Amos
MOLDED PLASTICS...

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Egan

extruder

Remote Control Panel

FOUR SEPARATE MAIN COMPONENTS

● "Tailored" Screw ● Independent Thrust Bearing Housing

● Individual Feed Section ● Heavy Wall Cylinder

Internal wiring for extruder and control panel complete to coded terminals for quick installation at any location.

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Write for details or invite our representative to call

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Designers and Builders of Machinery for the Paper Converting and Plastics Industries

Bound Brook, New Jersey

How "Dutch Boy" Normasal preserves the beauty of

vinyl flooring products

Color is the keynote in modern flooring products . . . and the flooring industry has found "Dutch Boy" Normasal the key to good color, when making high grade asbestos-filled vinyl formulations.

With Normasal, color changes that come from impurities sometimes trapped in asbestos fillers, are prevented. Normasal is the only stabilizer the industry has found that controls this condition satisfactorily.

Along with Normasal, flooring makers frequently use "Dutch Boy" Tribase. It provides the high heat stability needed in processing vinyl compounds.

Detailed technical data on Normasal, Tribase and other "Dutch Boy" stabilizers are available. So write us if you would like more information on these stabilizers and their application.

"Dutch Boy" Stabilizers

PRODUCT	USE
TRIBASE (Tribasic Lead Sulphate)	Electrical and other compounds requiring high heat-stability
TRIBASE E (Basic Lead Silicate Sulphate Complex)	Low volume cost insulation
DS-207 (Dibasic Lead Stearate)	Stabilizer-lubricant for sheeting, film, extrusion and molded compounds
PLUMB-O-SIL A (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored sheeting and upholstery stocks
PLUMB-O-SIL B (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored film, sheeting, belting
PLUMB-O-SIL C (Co-precipitate of Lead Orthosilicate and Silica Gel)	Highly translucent film and sheeting
DYTHAL (Di-basic Lead Phthalate)	General purpose stabilizer for heat and light. Good electrical properties
DYPHOS (Di-basic Lead Phosphite)	Outstanding for heat and light in all opaque stocks, including plastisols and organosols
[redacted]	As stabilizer or co-stabilizer in vinyl flooring and other compounds requiring good light-stability
BARINAC (Barium Ricinoleate)	Stabilizer-lubricant for clears
CALSTAR (Calcium Stearate)	Where non-toxicity and lubricity are required
LEADSTAR (Lead Stearate)	As lubricant and co-stabilizer

Dutch Boy* CHEMICALS *

*Reg. U.S. Pat. Off.

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Why Nebraska Plastics, Inc. uses NRM EXTRUDERS

"We use NRM Extruders and Accessory Equipment because: 1) We believe the quality and design of NRM Extruders is the best . . . 2) their line of extruders the most complete . . . 3) their line of accessories most complete . . . 4) their service to customers goes well beyond the mere sale of their equipment."

Nebraska Plastics' "COZAD" Plastic Pipe and Irrigation Tubing is being produced on this 3½" electrically heated NRM. The firm, which entered the plastic pipe business unintentionally, is today a national leader in the field.

At NRM, we're sure that balanced heat control, the quick-opening die-gate and corrosion-resistant cylinder construction are some of the NRM features which led officials of Nebraska Plastics, Inc. to the conclusions stated above. We're sure, too, that they're mighty important in **profitable** plastic extruding . . . but they're only a few of the many reasons why it will pay **you** to check the NRM **complete** line before purchasing thermoplastic extruding equipment. Do it TODAY.

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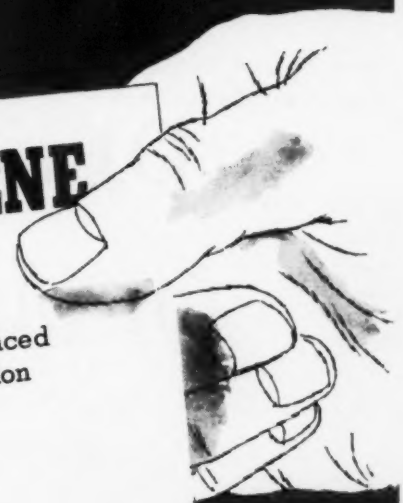

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l Drive

AXIS CROSSING DEVICE,
D PLASTICS INDUSTRIES:

motor, the power being transmitted
through universally jointed shafts.

ndvantages!

- ...uable adjustment of working speed, ratio 1:10, and of friction ratio from 1:1 up to 1,5:1,
...le synchronisation control,
- absolutely uniform distribution of load because the gears and also the motors are not carried on the roll necks, as well as the other advantages of the universal-joint shaft drive.

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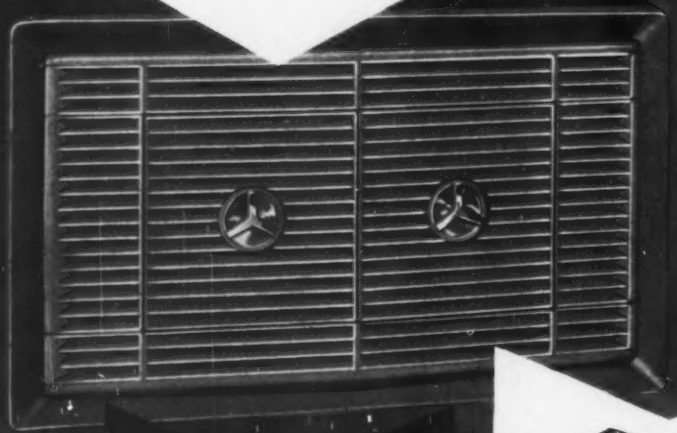
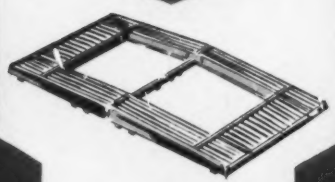
Santay and FEDDERS

POINT WITH PRIDE

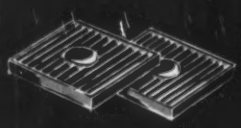
to this 1954
AIR CONDITIONER GRILLE AND ASSEMBLY



Outer decorative frame is molded on 60 oz. equipment.



Outer louvres, which direct air upward, are molded on 32 oz. equipment.



Center louvres are molded on 16 oz. press. Metal knobs and assembly adjust them for four-direction air delivery.

Perfectly Designed and Engineered for Production Molding. There's much to be said about the old adage, "Two heads are better than one." For the combined efforts of the Santay and Fedders-Quigan Corporations led to the development of the perfect plastic mold . . . used to make the new grille on the R.C.A. Room Air Conditioner manufactured by Fedders. *Technically, it is flawless . . .* after five months of continuous production not a single design or engineering change could be requested to facilitate processing . . . not one grille has failed to meet the strictest quality standards of the customer. Every part is precision molded of high impact polystyrene . . . Again inspected . . . then completely assembled and shipped to Fedders ready for immediate installation. *Economically, the mold is revolutionary,* for it may be used again to produce an entirely new design and thus keeps retooling at a minimum. Santay always points with pride to the products it molds . . . to the new and better ways it finds of giving you perfect combinations of metals and plastics.

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DRAPEX 3.2

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Drapex 3.2, at a fraction of the cost, gives your vinyls low temperature flexibility properties equivalent to dioctyl adipate. Its low volatility and low specific gravity (.905 at 20°C.) are additional economy features.

In addition, Drapex 3.2, because of its epoxy content, offers excellent stability . . . high heat resistance, low extractability, and resistance to water and sunlight.

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Aico's Complete Plastic Molding Service Includes:
ENGINEERING COUNSEL on proper molding methods and materials.
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MOLDING OF REINFORCED PLASTICS . . . a relatively new low-pressure development especially suitable for short runs of large lightweight pieces.
Aico plastics

MODERN PLASTICS

MARCH 1954 VOLUME 31 NUMBER 7

Futures For PLASTICS PIPE

Big markets beckon. Big capital is getting interested. Standards and engineering specs are being established. Competition will be keen and manufacturing margins will be slim. But business will be available for the bold, the efficient, and the ingenious

TWO years ago, one of the editors of MODERN PLASTICS forecast that pipe would become one of the five largest outlets for plastics materials within the next ten years. That forecast has by no means reached fruition to date, but activity among extruders and pipe makers certainly indicates that they intend to make it come true if humanly possible.

Statistics on the amount of plastics pipe now being produced are based on estimates, for there are no accurate figures available. Many commercial research companies have made exhaustive and expensive studies of the plastics pipe field for their clients, but their conclusions are far from unanimous. Each material supplier and each pipe manufacturer has his own ideas on how much raw material is being used for specific types of plastics pipe, but each will also admit that he is in no position to judge the entire field accurately. MODERN PLASTICS found an amazing conflict and variety of opinion on all points, which serves to emphasize the complexity and vast breadth of the pipe industry

MODERN PLASTICS
Thermoplastics Pipe and

POLYETHYLENE, Standard

Schedule 40 i.p.s.	A	Nominal Sizes	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	6"	†Cast pipe up to 36" dia. available in Polyethylene
		Outside Diameter [1]	.840	1.050	1.315	1.660	1.900	2.375	2.875	3.500	4.500	6.625	
		Inside Diameter	.622	.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026	6.065	
		Recommended working pressures, lb., 73.4° F.	104	86	81	68	61	52	51	50	42	31	
		Lengths	Coils from 100 to 500 ft.										
	B	[1] Special Types	Also furnished in extra heavy wall thickness with I.D.'s as shown above for higher pressures										

POLYETHYLENE, Rigid

Schedule 80 i.p.s.	C	Nominal Sizes	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
		Outside Diameter	.840	1.050	1.315	1.660	1.900	2.375
		Inside Diameter	.546	.742	.957	1.278	1.500	1.939
		Recommended working pressures, lb., 73.4° F.	240	190	170	140	130	100
		Lengths	10 ft.					

SARAN

Schedule 80 i.p.s.	D	Nominal Sizes	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	6"
		Outside Diameter	.840	1.050	1.315	1.660	1.900	2.375	2.875	3.500	4.500	6.625
		Inside Diameter	.546	.742	.957	1.278	1.500	1.939	2.277	2.842	3.749	5.761
		Recommended working pressures, lb., 77° F.	260	210	190	160	150	125	115	105	90	80
		Lengths	10 ft.									

BUTYRATE

Solvent Welded	E	Nominal Sizes	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	3-1/2"	4"	5"	6"
		Outside Diameter [2]	.600	.855	1.140	1.420	1.730	2.250	2.570	3.250	3.660	4.100	5.110	6.220
		Inside Diameter [2]	.500	.750	1.000	1.250	1.500	2.000	2.320	3.000	3.360	3.800	4.750	5.760
		Recommended working pressures, lb., 73.4° F.	166	118	119	116	129	107	94	80	75	72	70	70
		Lengths	20 ft. standard; some special lengths											
Schedule 40 i.p.s.	F	[2] Special Types	Also made in Schedule 40 i.p.s. sizes											

STYRENE Copolymers and Alloys

Solvent Welded	G	Nominal Sizes	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	3-1/2"	4"	5"	6"
		Outside Diameter [3]	.600	.855	1.140	1.420	1.730	2.250	2.570	3.250	3.660	4.100	5.110	6.220
		Inside Diameter	.500	.750	1.000	1.250	1.500	2.000	2.320	3.000	3.360	3.800	4.750	5.760
		Recommended working pressures, lb., 73.4° F.	200	150	150	150	150	140	125	100	100	90	90	90
		Lengths	10 ft. - 20 ft.											
	H	[3] Special Types	Also furnished with heavier walls to same O.D.											
Schedule 40 i.p.s.	I	Nominal Sizes	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	6"		
		Outside Diameter	.840	1.050	1.315	1.660	1.900	2.375	2.875	3.500	4.500	6.625		
		Inside Diameter [4]	.622	.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026	6.065		
		Recommended working pressures, lb., 73.4° F.	150	150	125	100	90	75	75	65	65	50		
		Lengths	10 ft. - 20 ft. - 30 ft.											
	J	[4] Special Types	Also furnished with thinner walls to same O.D.											
Schedule 80 i.p.s.	K	Nominal Sizes	Same as for Schedule 40 i.p.s. in Styrene											
		Outside Diameter	Same as for Schedule 40 i.p.s. in Styrene											
		Inside Diameter	.546	.742	.957	1.278	1.500	1.939	2.277	2.842	3.749	5.761		
		Recommended working	200	200	250	200	175	150	150	125	125	100		

S MAGAZINE'S
and Fittings Chart

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ALPHA PLASTICS, INC. 14 Northfield Ave. West Orange, N.J.	*M, N, P, Q, T, U*
AMERICAN AGILE CO. 5461 Dunham Road Maple Heights, Ohio	*A, B, L, M, N, O, P, Q, S, T, U* *+Larger Sizes†*
AMERICAN HARD RUBBER CO. 93 Worth St. New York, N.Y.	*C, D, I, K, N, O, U*
AMERICAN LUCOFLEX CORP. 500 Fifth Ave. New York, N.Y.	*L*
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GOODRICH CO., B.F. Industrial Products Div., Akron, O.	*L, M, N*
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JACKSON AND CHURCH CO. 321 North Hamilton St.	*U*

MATERIALS

POLYETHYLENE

CHEMICAL RESISTANCE

E - Excellent
F - Fair U - Unsatisfactory

Water Absorption % in 24 hr.	<0.01
Animal & Veg. Oils	F
Gasoline & Fuel Oil	U
Esters & Ketons	U
Alcohols & Glycols	U
Salt Solutions	E
Alkalies	E
Dilute Acids	E
Strong Acids	E
Organic Solvents	U
Caustic Solutions	E
Sulphates	E
Bleach Solutions	E
Soaps & Detergents	E

PHYSICAL PROPERTIES

Flex. Strength p.s.i. 1500 - 1700
Compressive Strength p.s.i. -
Tensile Strength p.s.i. 1500 - 1800
Specific Gravity 0.92
Izod Impact >16 ft. lbs. per in. of notch

BUTYRATE

(Formulas 265 M.H., 435 M.H., 218 M.H.)

CHEMICAL RESISTANCE

E - Excellent
F - Fair U - Unsatisfactory

Water Absorption % in 24 hr.	1.2-1.7
Animal & Veg. Oils	E
Gasoline & Fuel Oil	E
Esters & Ketons	U
Alcohols & Glycols	F
Salt Solutions	E
Alkalies (dilute)	F
Dilute Acids	F
Strong Acids	U
Organic Solvents	U
Caustic Solutions (dilute)	F
Sulphates	F
Bleach Solutions	F
Soaps & Detergents	E

PHYSICAL PROPERTIES

Flex. Strength p.s.i. 4900 - 7000
Compressive Strength p.s.i. 4800 - 7100
Tensile Strength p.s.i. 4500 - 6000
Specific Gravity 1.18 - 1.20
Izod Impact .8-6.3 ft. lbs. per in. of notch

SARAN

CHEMICAL RESISTANCE

E - Excellent
F - Fair U - Unsatisfactory

Water Absorption % in 24 hr.	0.1
Animal & Veg. Oils	F
Gasoline & Fuel Oil	E
Esters & Ketons	F
Alcohols & Glycols	E
Salt Solutions	E
Alkalies	E
Dilute Acids	E
Strong Acids	E
Organic Solvents	F
Caustic Solutions	E
Sulphates	E
Bleach Solutions	E
Soaps & Detergents	E

PHYSICAL PROPERTIES

Flex. Strength p.s.i. 4000 - 6000
Compressive Strength p.s.i. 7500 - 8500
Tensile Strength p.s.i. 3000 - 6000
Specific Gravity 1.65 - 1.72
Izod Impact .3-1.0 ft. lbs. per in. of notch

STYRENE ALLOY

CHEMICAL RESISTANCE

E - Excellent
F - Fair U - Unsatisfactory

Water Absorption % in 24 hr.	0.03
Animal & Veg. Oils	E
Gasoline & Fuel Oil	F
Esters & Ketons	U
Alcohols & Glycols	F
Salt Solutions	E
Alkalies	E
Dilute Acids	E
Strong Acids	E
Organic Solvents	U
Caustic Solutions	E
Sulphates	E
Bleach Solutions	E
Soaps & Detergents	E

		pressures, lb., 73.4° F.											
		Lengths	10 ft. - 20 ft.										

RIGID VINYL

Heat & Cement Welded	L	Nominal Sizes	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	3-1/2"	4"	5"	6"
		Outside Diameter	Same O.D. as for Butyrate S.W. Pipe											
		Inside Diameter	Same I.D. as for Butyrate S.W. Pipe											
		Recommended working pressures, lb., 73.4° F.	Not available											
		Lengths	10 ft. - 20 ft.											
Schedule 40 i.p.s.	M	Nominal Sizes	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"			
		Outside Diameter	Same O.D. as for Polyethylene 40 i.p.s. Pipe											
		Inside Diameter	Same I.D. as for Polyethylene 40 i.p.s. Pipe											
		Recommended working pressures, lb., 73.4° F.	300	250	225	200	200	200	180	160	150			
		Lengths	10 ft. - 20 ft.											
Schedule 80 i.p.s.	N	Nominal Sizes	Same as for Rigid Vinyl 40 i.p.s. Pipe											
		Outside Diameter	Same as for Saran Pipe											
		Inside Diameter	Same as for Saran Pipe											
		Recommended working pressures, lb., 73.4° F.	500	430	380	330	320	280	270	260	250			
		Lengths	10 ft. - 20 ft.											

MODIFIED VINYL

	O	Cementable & heat weldable	Special sizes + same as L, above							
Schedule 40 i.p.s.	P	Nominal Sizes	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	
		Outside Diameter	Same O.D. as for Polyethylene 40 i.p.s. Pipe									
		Inside Diameter	Same I.D. as for Polyethylene 40 i.p.s. Pipe									
		Recommended working pressures, lb., 73.4° F.	280	250	220	200	180	160	155	150	130	
		Lengths	10 ft. - 20 ft.									
Schedule 80 i.p.s.	Q	Nominal Sizes	Same as for Modified Vinyl 40 i.p.s. Pipe									
		Outside Diameter	Same as for Saran Pipe									
		Inside Diameter	Same as for Saran Pipe									
		Recommended working pressures, lb., 73.4° F.	400	350	300	250	250	200	200	200	175	
		Lengths	10 ft. - 20 ft.									

FLUOROCARBON

R	Nominal Size		1/8"	1/4"	3/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	3-1/2"
	Outside Diameter		.405	.540	.675	.840	1.050	1.315	1.660	1.900	2.375	2.875	3.500	4.000
	Inside Diameter	Schedule 40	.269	.364	.493	.622	.824	1.049	1.380	1.610	2.067	2.469	3.068	3.548
		Schedule 80	.215	.302	.423	.546	.742	.957	1.278	1.500	1.939	2.323	2.900	3.364
	Maximum working pressure(p.s.i.)	Schedule 40	387	375	304	292	238	222	183	164	151	138	131	119
		Schedule 80	560	523	436	406	334	308	256	232	217	200	186	171
	Lengths		All sizes stocked in 12 ft. lengths. Other lengths available											

FITTINGS

S — For Polyethylene Pipe (Insert Type, Molded of Styrene Alloy Copolymer)

1. Couplings
2. Male adapters
3. 90° Ells
4. Tees
5. Reducing Ells
6. Reducing Tees
7. Adapters
8. Clamps
9. Special Fittings

T — For All Solvent Welded Pipe (Slip Sleeve Type of Similar Plastics)

1. Couplings
2. 90° Ells
3. 45° Ells
4. Tees
5. Laterals
6. Flange Unions
7. Flange Adapter Unions
8. Reducers
9. Caps

U — For Threaded I.P.S. Pipe (Saran, Styrene Alloy, Rigid Polyethylene, Rigid Vinyl)

1. Couplings
2. 90° Ells
3. 45° Ells
4. Tees
5. Reducers
6. Adapters
7. Plugs
8. Flanges
9. Caps
10. Valves
11. Special Fittings

W — Fittings for Fluorocarbon Pipe

X — Special Metal Fittings for Plastics Pipe

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Only U. S.

	Saginaw, Mich.	
	KAYKOR INDUSTRIES, INC. Yardville, N.J.	*M, P, U*
	KEMTEK CORP. 206 Sylvan Ave., Newark, N.J. and 85 Academy St., Belleville, N.J.	*A, B, E, G, H, L, N*
6"	KRALOY PLASTIC PIPE CO., INC. 4710 E. Washington Blvd. Los Angeles 22, Calif.	*A, B, E, F, G, H, M, N, P, Q, S, T, U*
	K.S.H. PLASTICS CORP. High Ridge, Mo.	*E, F*
	LINEHAN AND CO. 2062 Irving Rd. Dallas 7, Texas	*A, B, C, E, F, S, T*
	MICHIGAN PLASTIC PIPE CO. 20050 Livernois Ave. Detroit, Mich.	*A, B, C,*
	MULCONROY CO. 54 & Jefferson Sts. Philadelphia, Pa.	*X*
	MUNRAY PRODUCTS, INC. 12500 Crossburn Ave. Cleveland, Ohio	*A, B, C, M, N, P, Q, S, U*
	NEBRASKA PLASTICS, INC. Cozad, Neb.	*A, C, E, F*
	PERFEX PLASTICS CO. 2632 E. Dearborn St. Chicago, Ill.	*A, C, I, J, K, M, N*
	PERMA-PIPE CORP. 2117 Cumberland Ave. Middlesboro, Ky.	*A, B*
	PLASTILINE, INC. White Plains, N.Y.	*S, T, U*
	PRIMA PIPE CO. Scottsbluff, Neb.	*A, B, E, F, G, H, I, M, P, Q, S, T, U*
	PYRAMID PLASTICS, INC. 554 Polk St. W. Chicago 7, Ill.	*D, K, U*
	REPUBLIC STEEL CO., PIPE DIV. Republic Bldg. Cleveland, Ohio	*A, E, S, T*
	RESISTOFLEX CORP. Belleville, N.J.	*R, W, + glass reinforced fluorocarbon*
	ROTUBA EXTRUDERS 435-88 St. Brooklyn 9, N.Y.	*A, B, E, F, S, T*
	SKYLINE INDUSTRIES Titusville, Pa.	*A, B, E, F, G, H, I, J, K, L, M, N, P, Q, S, T, U*
3-1/2"	SOUTHWESTERN PLASTIC PIPE CO. P.O. Box 306 Mineral Wells, Texas	*A, B, C, E, F, G, I, K, M, N, P, Q*
4.000	STOKES MOLDED PRODUCTS Taylor Street at Webster Trenton 4, N.J.	*U*
3.548		
3.364	TENCO, INC. 450 Endicott on Fourth St. Paul, Minn.	*P, Q*
119		
171	TRIANGLE CONDUIT & CABLE CO. 8900 Jersey Ave. New Brunswick, N.J.	*A, B, E, F, I, K, L, M, N, P, Q, S, T, U*
	UNITED STATES RUBBER CO. Chicago Die Mold Div., 4001 W. Wrightwood Chicago 39, Ill.	*H, I, J, K, M, N, U*
	U. S. GASKET CO. Camden 1, N.J.	*R, W*
	VAN DORN IRON WKS. 2685 E. 79th St. Cleveland, Ohio	*M, N, T, U, except U-10*
	VIPLAX PRODUCTS CORP. Beverly, N.J.	*A, I, J, K, L, M, N, P, Q, U-11*
	WALJOHN PLASTICS, INC. 435 88th St. Brooklyn 9, N.Y.	*A, B, E, F, S, T*
	WESTERN PLASTICS CORP. 3510 Ruston Way Tacoma 2, Wash.	*A, E, L, M, N, O, P, Q*
	YARDLEY PLASTICS CO. 142 Parsons Ave. Columbus 15, Ohio	*A, B, E, F, G, S, T, U*

PHYSICAL PROPERTIES

Flex. Strength p.s.i. 10,000 - 17,000
Compressive Strength p.s.i. 11,500-16,000
Tensile Strength p.s.i. 7000 - 12,000
Specific Gravity 1.05 - 1.11
Izod Impact .25 to 11.0 ft. lbs. per in. notch

STYRENE COPOLYMER

CHEMICAL RESISTANCE

E - Excellent
F - Fair U - Unsatisfactory

Water Absorption % in 24 hr.	0.3
Animal & Veg. Oils	E
Gasoline & Fuel Oil	F
Esters & Ketons	U
Alcohols & Glycols	F
Salt Solutions	E
Alkalies	E
Dilute Acids	E
Strong Acids (ex. oxidizing)	E
Organic Solvents	U
Caustic Solutions	E
Sulphates	E
Bleach Solutions	E
Soaps & Detergents	E

PHYSICAL PROPERTIES

Flex. Strength p.s.i. 6000 - 9000
Compressive Strength p.s.i. 12,000 - 16,000
Tensile Strength p.s.i. 3500 - 5500
Specific Gravity 1.05 - 1.15
Izod Impact 10-15 ft. lbs. per in. of notch

RIGID VINYL (UNPLASTICIZED)

CHEMICAL RESISTANCE

E - Excellent
F - Fair U - Unsatisfactory

Water Absorption % in 24 hr.	0.20
Animal & Veg. Oils	E
Gasoline & Fuel Oil	E
Esters & Ketons	U
Alcohols & Glycols	E
Salt Solutions	E
Alkalies	E
Dilute Acids	E
Strong Acids	F
Organic Solvents	U
Caustic Solutions	E
Sulphates	E
Bleach Solutions	E
Soaps & Detergents	E

PHYSICAL PROPERTIES

Flex. Strength p.s.i. 13,000 - 14,000
Compressive Strength p.s.i. 10,000 -11,000
Tensile Strength p.s.i. 6000 - 8000
Specific Gravity 1.45 - 1.50
Izod Impact 0.5-1.0 ft. lbs. per in. of notch

MODIFIED VINYL

CHEMICAL RESISTANCE

E - Excellent
F - Fair U - Unsatisfactory

Water Absorption % in 24 hr.	0.07
Animal & Veg. Oils	E
Gasoline & Fuel Oil	E
Esters & Ketons	U
Alcohols & Glycols	E
Salt Solutions	E
Alkalies	E
Dilute Acids	E
Strong Acids	U
Organic Solvents	U
Caustic Solutions	E
Sulphates	E
Bleach Solutions	E
Soaps & Detergents	E

PHYSICAL PROPERTIES

Flex. Strength p.s.i. 10,000 - 11,000
Compressive Strength p.s.i. 8000 - 9000
Tensile Strength p.s.i. 5500 - 6000
Specific Gravity 1.32 - 1.45
Izod Impact 1.0-18 ft. lbs. per in. of notch

FLUOROCARBON

CHEMICAL RESISTANCE

E - Excellent
F - Fair U - Unsatisfactory

Water Absorption % in 24 hr.	nil
Animal & Veg. Oils	E
Gasoline & Fuel Oil	E
Esters & Ketons	E
Alcohols & Glycols	E
Salt Solutions	E
Alkalies	E
Dilute Acids	E
Strong Acids	E
Organic Solvents	E
Caustic Solutions	E
Sulphates	E
Bleach Solutions	E
Soaps & Detergents	E

PHYSICAL PROPERTIES

Flex. Strength p.s.i. 2000
Compressive Strength p.s.i. 1700
Tensile Strength p.s.i. 1800 - 5700
Specific Gravity 2.1 - 2.3
Temp. Range -90° F. to + 800° F.

Only U. S. stock sources are listed here.

tor in any comparison with thermoplastic pipe.

Of course, there are thousands of feet of laminated phenolic tubing in use in this country and some of it might be classified as pipe, but it is not generally thought of in those terms. Phenolic asbestos pipe has been around a great many years, but it sells between $5.40 and $5.64 a ft. for 4-in. pipe and is limited to special applications where chemical resistance is required.

Comparison of Prices of Pipe Materials per Foot

Material	*½ Inch*	*1½ Inch*	*2 Inch*	*4 Inch*
Galvanized iron	$0.104	$0.305	$0.408	$0.39
Black iron	0.087	0.253	0.338	0.15
Stainless steel	1.28	3.11	3.78	9.34
Copper tubing—Type K	0.270	0.915	1.34	—
Lead AA (water)	0.460	1.730	2.07	—
Aluminum	0.184	0.462	0.57	1.59
Brass	0.650	1.93	2.54	8.08
Butyrate (best grade)	0.190	0.570	0.730	2.24
Polyethylene (best grade)	0.140	0.467	0.600	1.72

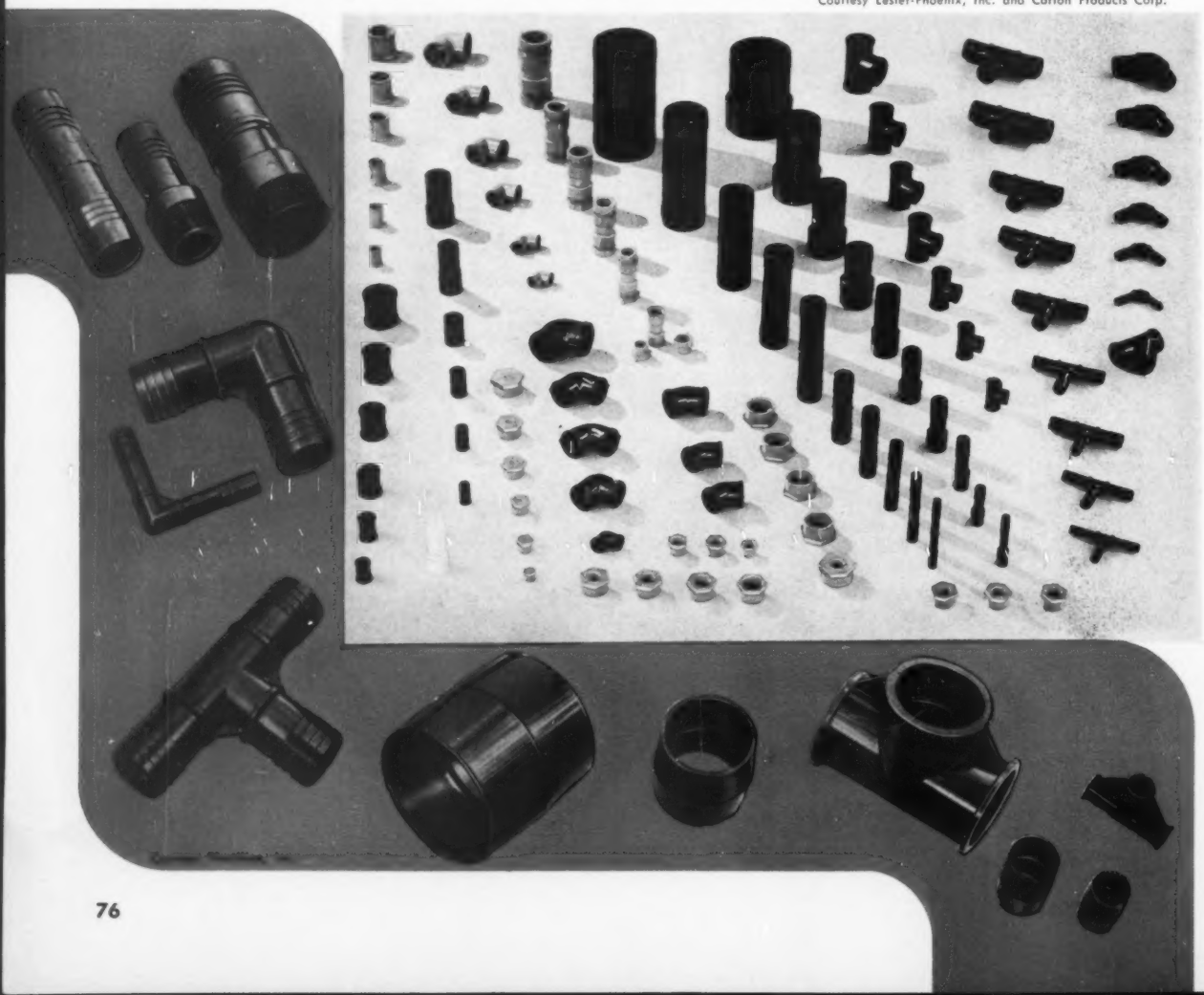
Fibrous Glass

Pipe of fibrous glass treated with polyester resin has been made in fairly substantial quantity by several companies, but it still remains largely on a trial basis. In fact, several resin producers have stated that there is today no suitable polyester resin for satisfactory resin-glass pipe, but they hope to develop one soon. The greatest problems seem to be degradation of the resin and leakage of whatever fluid may be flowing through the pipe. Epoxy resins are being tried, but currently, at least, the results are still unproved and the cost is high. At least one company is trying low-pressure type phenolic resin with fibrous glass, but has, as of the time this issue went to press, not yet made a progress report.

There seems no doubt that a good leakproof, shatterproof, chemically-resistant fibrous glass pipe could be sold to a big market—perhaps 6 or 8 million ft. a year—but first a more satisfactory pipe must be developed.

Keeping pace with the progress being made in the plastics pipe field are plastics pipe fittings, including 90° ells, 45° ells, tees, connectors, and adaptors. The representative groups of fittings below were largely molded of styrene and butyrate

Courtesy Lester-Phoenix, Inc. and Carlon Products Corp.



It would probably always be in limited volume when in competition with large size (anything over 4 in.) metal pipe because of higher cost, except in those particular fields where corrosion from soil, or the liquid to be carried, is present.

The United States Navy is trying to develop fibrous glass pipe for use on shipboard but the project, also, is still on an experimental basis.

However, there are many people who are convinced that polyester-fibrous glass pipe has a great future. For example, Youngstown Sheet & Tube Co. recently purchased the Perrault pipe plant in Oklahoma where they expect to develop an improved fibrous glass pipe. A California firm reports that it is selling substantial quantities. If and when the resin and engineering difficulties are worked out, reinforced plastics pipe will undoubtedly become an important factor in the pipe industry.

Courtesy Eastman Chemical Products, Inc.

Air blast conveys Dixie cups from forming machines, hundreds of feet away, through transparent butyrate pipe to packing and shipping area without damage to cups

The three principal plastics that actually have been used in fairly good-sized quantities of pipe in service in the United States and abroad are polyethylene, cellulose acetate butyrate, and rigid vinyl. A fourth and new contender is high-impact copolymer styrene, but experience with this type of pipe is so recent and so new that information concerning its performance is difficult to evaluate. Developers are particularly concerned in finding out how it will stand up under fatigue tests.

A new type of styrene copolymer resin that has just come on the market has also joined the fight for pipe business. Its advantage is claimed to be that it can be highly filled with graphite or low cost fillers and still take a terrific beating. However, only a few feet have so far been produced and no one knows how it will perform under continued stress.

POLYETHYLENE

Polyethylene pipe is the biggest volume plastics pipe material now on the market. There are all sorts of claims as to its actual volume, but the most authenticated sources MODERN PLASTICS can find indicate that 20 million lb. of virgin polyethylene, plus 4 or 5 million lb. of scrap resin, is a close approximation for 1953.

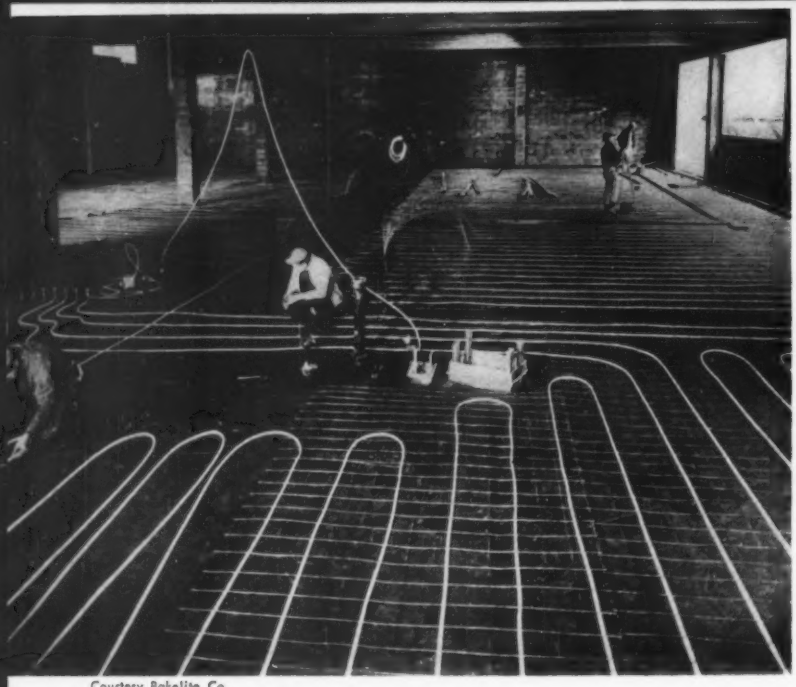
All but approximately 3 million lb. of the polyethylene pipe used in 1953 are thought to have been used for private water systems—jet wells, tapped wells and springs, etc. Such uses are generally in rural communities and largely for agricultural purposes wherever farmers find need for conveying water.

Half of the 3 million lb. mentioned above was used for mine pipe—a much lower volume for this purpose than in the years 1951 and 1952.

The other 1½ million lb. was used largely for such purposes as golf

Dimensional Specifications and Tolerances for Flexible Standard Wall Polyethylene Pipe as Proposed by S.P.I. Designation: TP-2-52

Nominal size	*Inside diameter*	*Wall*	*Wall tolerances (plus or minus)*	*Inside diameter tolerances*		*Weight*	
				Plus	*Minus*	*Minimum*	*Nominal*
In.	*In.*	*In.*	*In.*	*In.*		*(lb. per ft.)*	
½	0.622	0.109	0.006	0.010	0.010	9.5	10.3
¾	0.824	0.113	0.006	0.010	0.015	12.7	13.3
1	1.049	0.133	0.007	0.010	0.020	18.6	19.6
1¼	1.380	0.140	0.007	0.010	0.020	25.4	26.7
1½	1.610	0.145	0.008	0.015	0.020	30.2	31.8
2	2.067	0.154	0.008	0.015	0.020	42.7	45.0
2½	2.469	0.203	0.009	0.015	0.025	65.9	69.4
3	3.068	0.216	0.010	0.015	0.030	85.5	90.0
4	4.026	0.237	0.012	0.015	0.035	119.0	125.0
4	6.065	0.280	0.015	0.020	0.035	221.0	233.0



Courtesy Bakelite Co.

Lengths of ¾-in. polyethylene tubing are laid out on sub-floor in radiant heat installation. Use of polyethylene tubing halves installation time required with metal pipe

course irrigation, skating rinks, freezing plants, and food and beverage plant water lines. Also included in this miscellaneous classification would be conveyance of materials for treatment of city water systems and piping for cannery waste and other types of industrial drainage. Use of polyethylene pipe or tubing for home lawn sprinklers is also included in this classification in order to separate it from the "rural uses" mentioned above.

The dollar value to the pipe manufacturer for 25 million lb. of polyethylene pipe would be in the neighborhood of 17 or 18 million dollars. The pipe producer sells it from 12½¢ a ft. (before discount) for ½-in. pipe to around $2.75 for 6-in. pipe.

The 1953 total of polyethylene pipe is considered to be 8 or 10 million lb. higher than the 1952 figure. The 1950 and 1951 volume could hardly have been as much as 5 million lb. a year, but those years mean little on a growth chart, anyhow, because polyethylene was even more scarce in those years than it is now. Nearly all polyethylene pipe then available was channeled into coal mine service as a replacement for extremely scarce metal pipe. Its use as jet well pipe was just beginning during those days.

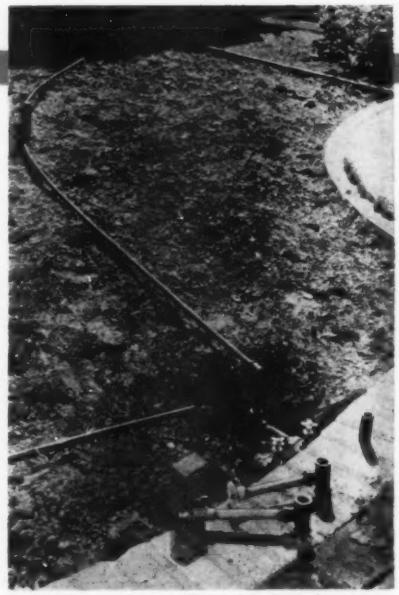
Estimates for 1955 volume can be only very rough guesses. Conservative sources estimate a volume anywhere from 35 to 50 million lb. of polyethylene pipe for that year. The 1960 estimates vary all the way from 75 to as high as 150 million pounds. The estimates printed here come from sources that must remain anonymous, but they are companies whose calculations have seldom been wrong in the past. The most astounding thing about their outlook on the pipe situation is their wide difference of opinion about not only the future, but also about what is actually being done today.

Pipe for Mines

The first big impetus to polyethylene pipe production came in the early days of the Korean War when coal mine operators couldn't get metal pipe and so turned to polyethylene. The so-called substitute turned out better than the original because it is not affected by corrosion and will outlast metal drainage pipe in coal mines by many years. It is rapidly becoming standard equipment in coal mines and apparently has only one drawback. The replacement market is small because the pipe never wears out. However, it is assumed that other types of mines will find polyethylene pipe a useful tool, although no statistics on possible volume in that field are currently available.

The second big impetus to polyethylene pipe production came from jet wells which are widely used for general farm purposes in all parts of the country. There were 228,000 jet units installed in the first six months of 1953 and 105,000 shallow non-jet wells that could use polyethylene pipe. It is believed that about 190,000 of the jet wells could use polyethylene pipe since it is not recommended for wells over 125 ft. deep nor where pressure in excess of 100 p.s.i. is involved.

Since two lines of pipe are involved in a jet installation, a 125-ft. well would require 250 ft. of pipe. However, the majority of the wells are not that deep. But even if each well required only 100 ft. of pipe, the 190,000 jet wells in the first half of



Courtesy Eastman Chemical Products, Inc.

T-joints for sprayheads (foreground) are only fittings used in curved section of butyrate lawn sprinkling pipe

1953 would have required 19 million ft. of polyethylene if they had used it and the 105,000 non-jet shallow wells could have required another 3 million feet. That 22 million ft. of 1¼-in. pipe would weigh nearly 6 million pounds. Thus the potential 1953 market for polyethylene well pipe would have been a conservative 11 or 12 million lb. with a dollar value to the extruder of some $8 million for the whole year, if the second half equalled the first. The technique of water well con-

struction in the United States is now going through a period of great change with an increasing use of jet wells and submersible pumps. Polyethylene pipe may play an important part in this evolution, especially since its installation is made at lower labor cost—as much as $43 in an average two-pipe jet.

In addition to the pipe actually used in wells, farmers could use at least three times more footage in piping water from their wells or springs to drinking troughs, barns, and wherever water is needed. There is a cattle ranch in Nebraska now using 6 miles of polyethylene pipe for transportation of water to drinking tanks. One-mile installations are not unusual. Farmers don't even have to worry about frozen water bursting the pipe unless unusual pressure is developed. If the polyethylene pipe is laid with a few loops in it (called by pipe men "snaking" it) to take care of expansion and contraction, there is little danger of bursting because of its excellent resistance to low-temperature extremes. Trouble, however, has developed in the past from fittings pulling off.

Of course, farmers don't expect to use surface pipe of any kind for carrying water in the winter time, but if they leave the pipe out for the winter, polyethylene is less likely to be damaged. If it is necessary for the pipe to carry water in winter, it must be buried.

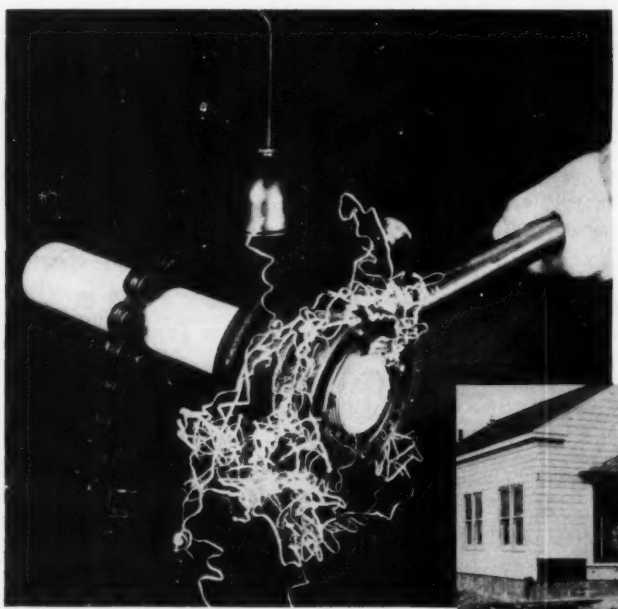
It is now being proved that pure polyethylene water pipe will never be troubled with a toxic or bad taste charge. It is a substance very similar to paraffin, which has been used with food for generations. It is true that some pipe makers produce polyethylene pipe that they say must not be used for carrying drinking water, but that particular pipe is "mine" grade.

In Irrigation

In addition to carrying water from wells and coal mines, polyethylene pipe has a great potentiality in irrigation. But pipe producers will have to devise means and methods for proving their product if they expect to capitalize on this presumably extensive market.

An example of what's going on in just one area might be cited. It is a 100-sq. mile spot in the west Texas dust bowl area where farmers began to tap the underground water flow shortly after World War II. The cotton yield per acre was doubled by irrigation after this program began. Some 25,000 pumps are needed in that area. Many of them are and more could be jet wells. Two hundred to 1300 ft. of pipe is needed for each well and its distribution system. Most of the pipe in this area is laid on the surface and the water is tapped from ditches or large concrete pipe.

Aluminum pipe which, with fittings, costs somewhere near $1.30 a ft., has won a good portion of this market. There is some debate over whether or not polyethylene at pres-

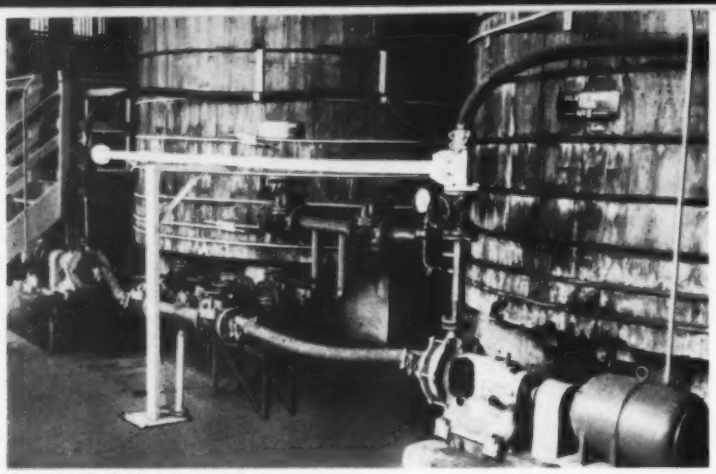


Courtesy B. F. Goodrich Chemical Co.

Rigid vinyl pipe can be easily threaded with standard pipe dies and may be equipped with acid-resistant plastics couplings, flanges, and caps

Courtesy Bakelite Co.

Flexible polyethylene pipe curves readily to follow trench lines and uneven surface contours in this well-to-house water pipe line installation



Courtesy B. F. Goodrich Chemical Co.

Highly corrosive brine, containing rubber particles, is carried in rubber plant by rigid vinyl pipe which does not plug up and has no welded joints to which particles might stick

ent prices can compete in this situation with aluminum.

Also, because the material degrades under the sun's rays, it seems best that polyethylene pipe be made of pigmented stock or else buried; but those are certainly not insurmountable factors. In overhead sprinkling systems, aluminum has so far held top rank because it is low in cost, easy to move, and is not affected by the sun. Something like 3 million lb. of aluminum pipe were used for irrigating 600,000 acres in 1952, and an estimated 6 million acres is a possibility for the future. Only the future can show whether or not polyethylene is going to take over a portion of this particular part of the irrigation field. In those cases where it is more practical to bury the pipe, especially in areas where corrosive soil is encountered, polyethylene has a chance. But for surface or overhead pipe, the case for plastics must still be proved by development and trial. The total acreage for all kinds of irrigation in the United States is something like 25 million acres, with another 20 to 25 million in prospect.

In Nebraska, where 1953 was the driest since 1937, dry-farmed crops produced no yield while land irrigated from deep-water wells through polyethylene pipe gave normal crop yields. Such an experinece as this may be prophetic of the time when nearly every farmer will own a portable water system, employing hundreds of feet of pipe, just as the average householder uses 50 or more feet of hose for watering his lawn or garden. Polyethylene is a prospect for a good part of that potential market. In fact, polyethylene lawn-sprinkling systems are even today invading the home market as well as golf courses and large estates.

Dimensions and Nominal Weights for Solvent Welded (SWP). Lightwall, Grade A Butyrate Pipe as Proposed by S.P.I. Designation: TP-3-52

Nominal size In.	*Outside diameter In.*	*Wall thickness In.*	*Nominal lb. per 100 ft.*
½	0.600	0.050	5.0
¾	0.855	0.053	7.5
1	1.140	0.070	13.5
1¼	1.420	0.085	20.0
1½	1.730	0.115	32.0
2	2.250	0.125	45.0
2½	2.570	0.125	52.0
3	3.250	0.125	65.0
3½	3.660	0.150	89.0
4	4.100	0.150	100.0
5	5.110	0.180	148.0
6	6.220	0.230	233.0

In Drainage Use

Other possibilities for plastics pipe are the thousands of miles of clay drainage tile used in this country, thousands of miles of iron pipe used for municipal water systems, and greenhouse sprinkling systems which now use over 100 million ft. of steel pipe.

Plastics pipe could never hope to encompass all of these markets, but it should capture enough to make a thriving business. At this time it doesn't seem likely that pipe over 10 in. in diameter, such as that needed for main line irrigation or water mains, will ever be practical in plastics unless a resin-glass material with satisfactory properties and lower cost should be developed. However, all branch lines that carry water from a main irrigation ditch or large pipe to its destination are possibilities.

Pressure a Problem

It is recognized that many questions concerning the practicality of polyethylene pipe must be answered before it will ever reach that 60- or 100-million lb. consumption goal. Pressure is one of them. Polyethylene is seldom recommended for pipe when inside pressure is more than 40 lb., but most producers think it can go up to 80 lb. without failure. For water pipe on farms, 40 lb. is generally sufficient, but in some places where steep hills are encountered, greater pressure might be necessary. There have been failures when ice formed in the pipe, but only when the pressure was left on.

Most municipal water systems employ less than 80 lb. pressure. Extra heavy polyethylene pipe has been approved by some municipalities, but they require double wall thickness for 1½-in. pipe—and that means more than double the price, or well over $1.00 a foot.

Because of its newness, there are no long-term experiences to deter-

mine how well polyethylene pipe will stand up in various services after aging. All failures recorded so far have been quick failures. No one is sure, for example, how it will stand up under long-time exposure to detergents and greases in waste lines.

All these things and many others must be studied before anyone can be sure where polyethylene pipe is going. Caution is required when hot water is to be carried, yet there are cases on record where it has been used for three years at a maximum temperature of 140° F. at a maximum pressure of 40 p.s.i. When a length of it that ran over a steam pipe was ruined, the user simply insulated a new length, put it in place, and has had no trouble since. It can be used in radiant heat systems that operate at about 120° F. because the hot water doesn't hurt it when it is embedded in cement.

Polyethylene does not seem practical for carrying petroleum, but it is being used in oil field water systems. In Nebraska, it is being used to carry natural gas.

The possibilities for polyethylene pipe are vast. If producers insist on making only good quality pipe and refuse to allow installations in places where it doesn't belong, polyethylene pipe may even go beyond the expectations of today's dreamers despite the fact that it has limitations which must be carefully considered in making long-term predictions.

BUTYRATE

Cellulose acetate butyrate pipe production increased from an estimated 1½ million lb. in 1951 to between 3 and 4 million lb. in 1953; it is conservatively estimated that it will reach 7 million lb. in 1955. In dollar volume of finished pipe, that means an average of around 85¢ a lb. to the extruder.

These volume figures are rather modest when compared with polyethylene, but butyrate is a more costly material and butyrate pipe found no such quick markets as was the case with polyethylene in mine pipe, jet wells, and farm pipe. Aside from flexible syphon tubing used in irrigation, butyrate pipe has been little used in that field in the United States, although Australians are making quite a commotion over it.

Oldest use of butyrate pipe in this country is an installation of over

(*Continued on p.* 181)

Shipments of Pipe in the United States—1952

Material	*Tons*
Concrete	11,300,000
Steel and wrought iron[a]	8,484,000
Cast iron	1,964,000
Clay sewer pipe and fittings	1,540,000
Transite	185,000
Copper[b]	162,000
Brass and other alloys[b]	93,000
Aluminum[c]	36,000
Plastic	?

a Steel is used in five basic pipe types: standard, oil country goods, line pipes, mechanical tubing, pressure tubing. Standard is used for radiant heating, water pipe, irrigation systems, truck gardens, nurseries, greenhouses. Between 2 and 3 million tons are produced annually — much of it subject to plastics competition. Oil country goods consume between 1½ and 2 million tons annually, mostly high pressure pipe and not fitted for plastics competition. Line pipe consumes around 3 million tons a year and is used for gas transmission and petroleum separation lines. A good portion of line pipe is subject to plastics competition. Mechanical tubing, consuming about 1 million tons a year, is a structural material and is not subject to plastics competition. Pressure tubing consumes about ½ million tons a year. There is possible use for plastics in a small portion of the 10,000 tons of stainless steel 1-in. tubing produced.

b Copper is replacing much steel in domestic and industrial applications where corrosion must be avoided. Plastics could be used in a portion of this market.

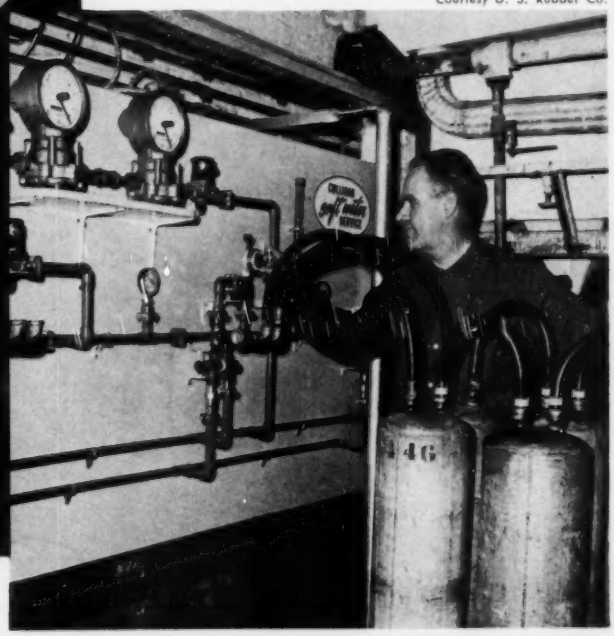
c Mostly for irrigation. Plastics can compete for a great part of this market.

Courtesy B. F. Goodrich Chemical Co.

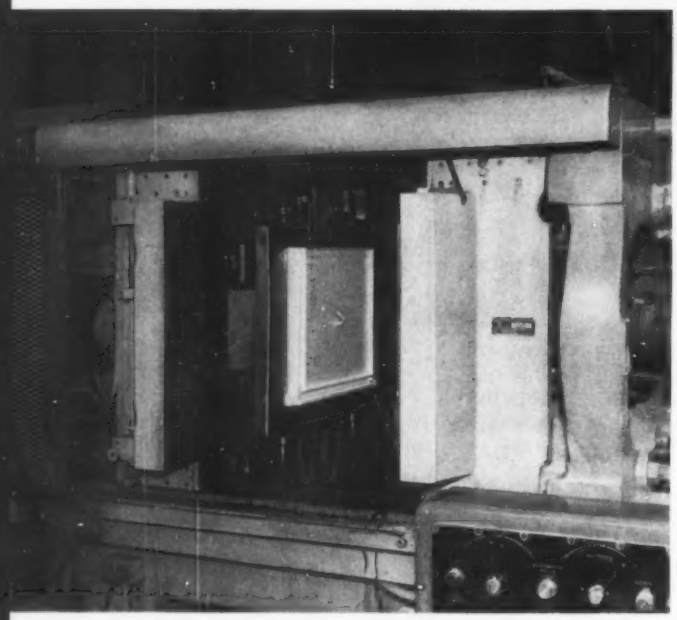
Jet of hot air is used in welding rigid vinyl pipe and flange, using a welding rod made of the same material

Brine solution of 100% strength is pumped through rubber-modified styrene copolymer pipe in water softening plant

Courtesy U. S. Rubber Co.



Costs Cut



Styrene sheet replaces molded section as the bottom half of a newly-designed refrigerator drip tray. Only top half of the tray is now molded (above)

MORE efficient production and lower costs are the results of a new technique for fabricating the bottom panels of refrigerator drip trays from styrene sheet.

Primary function of the drip tray, or baffle assembly as it is often called, in a low-cost refrigerator is to serve as a buffer between the food cooling area and the freezing chest. Because of its position directly under the ice cube compartment, however, the ends of the unit are usually turned up so that it can double as a tray to catch water as it drips from the compartment.

Prior to the development of the new fabricating procedure, the drip tray assembly consisted of two injection molded styrene parts cemented together with insulation between. Both the top section—the part which is turned up to make the baffle serve as a tray—and the bottom section had to be molded separately—a fairly expensive manufacturing operation.

All photos courtesy Visi Corp.

After removal from single-cavity mold, top half of tray is trimmed of flash and readied for the assembly line

Assembler fills the shell of molded top section with insulation batting, places the styrene sheet over the batting, and cements the sheet to the molded top section

With Styrene Sheet

One of two molded parts replaced with fabricated sheet in new design of refrigerator drip tray

Fabricating of the bottom part of the tray from oriented styrene sheet, according to both the molder and the customer, offered a convenient and economical substitution for the injection molded section.

Because the bottom section, main function of which is to hold the insulating material in place, does not require excessive rigidity, the styrene sheet was sufficiently tough to fill the requirements. In contrast to the injection molded part, which because of its large area could not be reduced in thickness below 0.100 in. and still be successfully molded, a styrene sheet only 0.020 in. thick proved satisfactory. As a result of this change, the cost of the bottom section of the tray was cut approximately 75 percent.

Production Procedures

On the production line, the top section of the drip tray is injection molded as in the past. To make the new bottom section, rolls of styrene sheet, slit to one dimension, are fed into a cutter where they are cut to the second dimension. Approximately 750 tray bottoms are cut from the one roll.

Assemblers then take the molded top section, insert the insulation batting in it, and place the sheet over the insulation. After cementing the styrene sheet to the molded part, all that remains is for a trimmer to pare any insulation batting that hangs out of the tray.

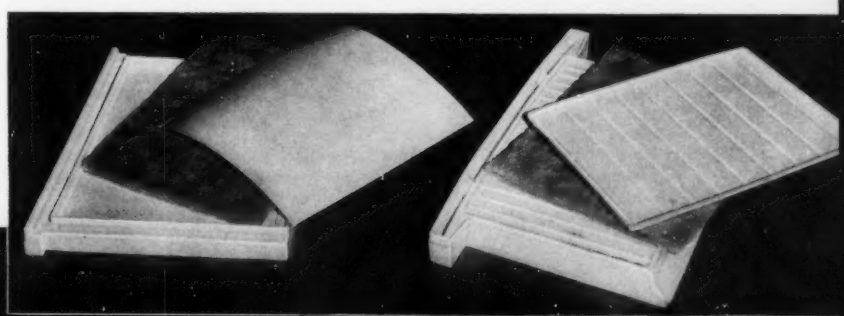
In addition to a reduction in cost of the bottom section, the styrene sheet provides several other advantages. The thinner and lighter sheet substantially reduces the shipping weight of the unit and thus lowers shipping costs. Elimination of the double-molding operation also results in a reduction of some tooling costs and leads to faster delivery of the assembled part.

The thinness of the styrene sheet allows it to conform better to the surface of the molded top section. This in turn makes the unit substantially more watertight. Rigorous tests have also shown that the styrene sheet will not shrink or warp at refrigerator temperatures.

In addition, the styrene sheets take up substantially less storage space than the molded sections. The assembly itself is simpler to design since it requires less fitting and has less of the shrinkage problem that is common to injection molded parts.

The success of styrene sheet for this application has led to the adoption of the new drip trays in two other refrigerator models to be introduced this year.

CREDITS: Drip tray molded and fabricated by Nosco Plastics, Div. National Organ Supply Co., Erie, Pa., for Westinghouse Electric Co. Polyflex styrene sheet supplied by Plax Corp., Hartford, Conn.



Styrene sheet which serves as bottom half of new tray (left) is 1/5 as thick as the molded section previously used (right)

Any insulation batting that hangs out of the assembled tray is trimmed off

PHENOLIC RESIN SLIMS DOWN

Casting technique avoids expensive machining of molds, saves time and labor in more efficient mass production

MANUFACTURE of rubber girdles has been reshaped by a mold-making method which reduces production time, holds down the need for highly trained personnel, and effectively controls cost figures. The process strips away the costly necessity for machining numerous original molds, and instead utilizes a phenolic casting resin for multiple duplication of the master pattern. It is being used in the Woonsocket, R. I., plant of American Wringer Co., which has an annual output of hundreds of thousands of one-piece, form-fitting, ventilated latex girdles in four sizes—small, medium, large, and extra large.

Fashion-conscious ladies have been besieged by "girth control" publicity and by constant advice to feel better and look smarter by enclosing their curves in latex rather than the old-style woven "clutchers" with confining panels, bones, stays, tapes, threads, laces, and zippers. The buying impulse created by ads stressing freedom of movement and better fit is clinched budget-wise because the rubber girdles can be economically made by a dipping process. A patterned form is immersed in liquid latex which then solidifies around it. Obviously, to attain the rapid mass production which makes possible the lowest sales price, many molds must be simultaneously dipped.

Virtually unlimited numbers of these dipping forms can be cast of phenolic resin in vinyl molds at an estimated cost of only $6 each—including materials and labor—from a machined original which costs a contrastingly large 70 dollars. Despite their relative economy, the plastic pattern duplicates are said to improve rather than lessen end-product quality. They are created in a fraction of the time that would be required to machine every mold separately from combinations of wood and metal, and most stages of their fabrication can be handled by unskilled factory hands instead of by highly-paid, technically trained workmen.

From Pattern To Vinyl Mold

The first step in the procedure, as in any plastic reproduction process, is the making of the original pattern. The girdle master, gently curved like a woman's hips, is fabricated of wood and steel. Great care is taken to make the surface absolutely smooth because any roughness and any undesirable detail, even wood grain, will be reproduced with absolute fidelity in the subsequent steps.

In preparation for making the mold, a thin sheet of steel is laid on the make-up table to act as a tray for a heavy steel chase which is placed upon it. The original wood-and-steel master is set into this chase and surrounded by a metal

1 Vinyl sheeting goes over the build-up around the original pattern and over a metal frame in preparation for insertion into hydraulic press

2 After being formed under heat and pressure, one-half of vinyl mold, in which phenolic shape will be cast, is complete

Photos courtesy Marblette Corp.

GIRDLE COSTS

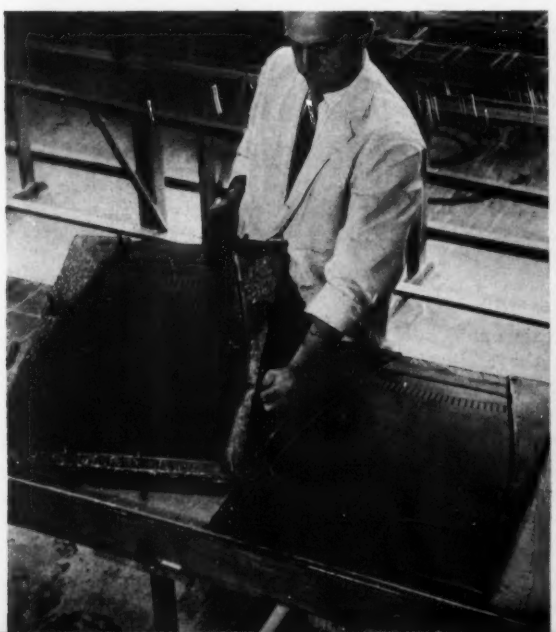
Production rate is up and manufacturing costs are down when rubber girdles are produced on sturdy and durable phenolic forms cast in precision-made vinyl molds

frame half the depth of the pattern. This frame fits exactly around the pattern and the inside of the chase. All exposed surfaces of the cut-out frame and of the original pattern are coated with a release agent. Sheets of vinyl are then cut precisely to shape and inserted as build-up around the shoulders of the pattern. When sufficient build-up has been obtained, a large sheet of the same vinyl material (Fig. 1) is laid over all. This sheet is then topped with a backing of ¼-in. steel plate which has been coated with cement so that it will bond firmly to the vinyl.

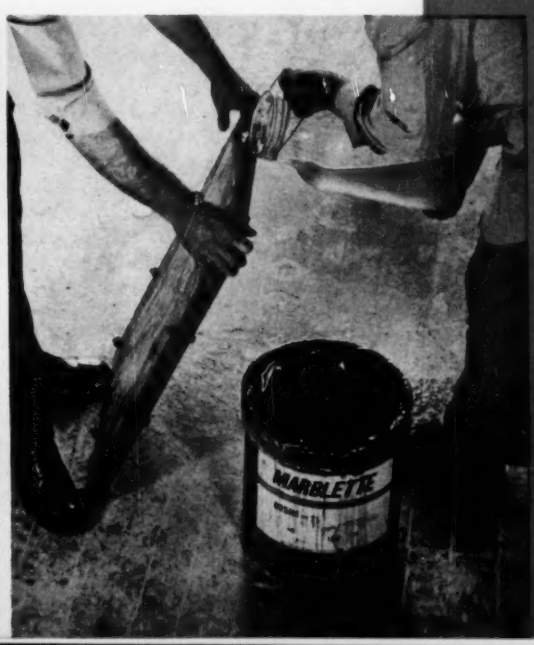
The prepared chase is next placed in a hydraulic press, the platens of which have been preheated to 307° F. A ram pressure of 1000 p.s.i. is maintained for 20 min.; this is then increased to 2000 p.s.i., and held for an additional 15 min. at the same heat level. The heat is then discontinued and cold water is circulated through the platens for 30 min., while pressure is retained. Half of the vinyl mold is now completed (Fig. 2).

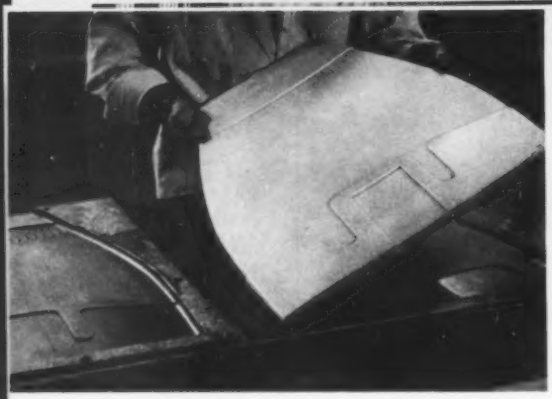
Next stage is a repetition of the previous one. The pattern is reversed, the build-up and release-

3 Gasket is used to facilitate the opening of the two halves of the vinyl mold after completion of each cast

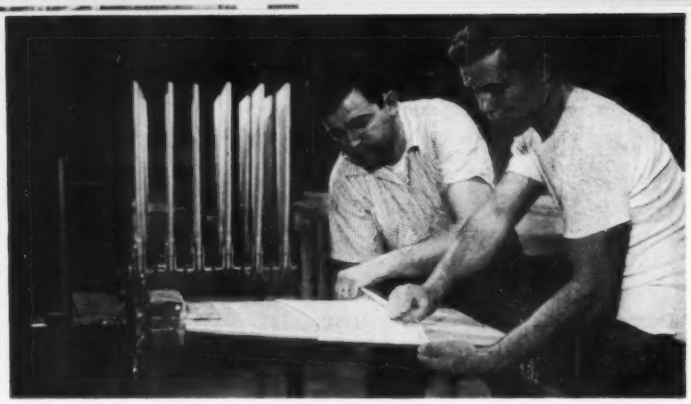


4 After mold is rinsed, it is held at an angle while casting resin is poured into it





5 After baking, the hardened, light-colored phenolic production form is removed from unbolted vinyl mold



6 In production, several groups of phenolic forms are dipped in latex simultaneously; after rubber solidifies, completed girdle is stripped from each form

agent coating are carried out in the same manner as before, and the pressing process is repeated. These duplicate steps yield the two identical halves for a complete vinyl mold, each half backed with ¼-in. steel plate to provide rigidity for subsequent handling.

In order to insure accurate alinement of the holes for the studs which will hold the mold halves together during the casting process, the original pattern is now temporarily inserted between the mold halves and the edges are held together with clamps. After the holes have been drilled, the mold halves are again separated, and the original is set aside. A gasket is then made (Fig. 3) to facilitate opening of the double mold after each cast has been made.

Casting the Production Form

When preparing for casting, the two mold halves are put together and the closure nuts are run up loosely on the studs. The mold is then heated for 2 hr. at 185° F. in an ordinary oven.

After this preheating, the warm mold, with closure nuts tightened securely, is subjected to a rinsing procedure, the purpose of which is to ready the surfaces of the mold for the final casting and to insure that trapped air in the casting resin will be kept to a minimum. The workmen pictured in Fig. 4 are pouring in the rinse—a mixture of 5 lb. of phenolic resin with 5 lb. of denatured alcohol and ½ lb. of acid. The rinse is poured out again almost immediately—remaining for just the brief moment necessary to coat the vinyl surfaces.

The phenolic resin used in casting is the same as that in the rinse; 10% acid by weight is added 1 hr. beforehand, and the preparation kept at room temperature. Pouring the resin into the steel encased vinyl mold is done in the same way as the rinsing operation. To avoid trapping air in the bottom of the elongated rectangle, the mold is kept tipped at a 45° angle during the pouring. The mold is not filled all the way to the lip, space being left at the top for expansion of the resin, which occurs during cooling.

The filled vinyl mold is put on a vibrating platform, where it is shaken for 15 min. to accelerate the freeing of any air bubbles which might cling to the sides. These rise to the top surface, which is brushed with alcohol to dissolve the skin of the bubbles and in this manner break them.

Baking of the resin-filled molds for 4 hr. at 185° F. follows. Figure 5 shows the hardened form, in the exact shape and dimensions of the original pattern, removed from the unbolted halves of the mold.

By immediately readying the molds for another cast, significant time savings are made. When the cured form is removed, the molds are still at a satisfactory preheat temperature for pouring of the casting resin. The two halves of the mold are therefore quickly refastened, the next pour is made, and the other steps in the process are repeated without delay.

Mold Correction

Despite the fact that air bubbles do not readily form in the casting material, and the care taken during the casting process to prevent their formation, some may occur in and around the sharp edges of the lower end of the form. These are easily corrected during the finishing stage by the use of a patching material called Lab-Metal. This is a gray-colored substance of very loose consistency, thoroughly compatible with the phenolic, and removable without damage by a methyl-ethyl-ketone solvent. When the patching material has hardened, the entire surface of the pattern duplicate is brought to a fine smoothness by sanding.

After attachment of the form to a metal shoe which grips it during dipping, it is ready for girdle production. Groups of forms are dipped at one time into liquid latex. After speedy solidification, the rubber girdle is pulled off each form (Fig. 6) and the forms are ready for another dip.

The smoothly polished surface of the cast phenolic form is unaffected by many repetitions of latex dipping. Since wear on the pattern duplicates is such a negligible factor, long production runs become an economical reality.

After the girdles are removed from the forms, they are flocked, trimmed, and perforated; garters are attached; each one is individually packaged; and they start on their way to the eventual customer. Little does Milady realize as she tugs the girdle over her mid-section, how great a part plastics have played in making her lovely figure more plastic!

CREDITS: Mold making process developed by American Wringer Co., in collaboration with The Marblette Corp., Long Island City, N.Y. Vinyl material is Koroseal from B. F. Goodrich Co., Plastics Div., Marietta, Ohio; adhesive is Plio-Bond. supplied by The Goodyear Tire & Rubber Co., Akron, Ohio. Mold rinse and casting resins are Marblette Resin #71. Lab-Metal patching material is from Alvin Products, Inc., Worcester, Mass.

Glass Cloth as a Drafting Medium

THROUGH the development of suitable fibrous glass-polyester laminates, manufacturers can now prepare original scale drawings—using pencil, ink, or metal scribing tools—which will accurately retain their dimensions even during filing, shipping, or storage. The laminates, when treated with photo-sensitive emulsions, can also be used as a medium on which copies of drawings can be photographically reproduced from original drafting work, done on either metal or paper.

In view of the fact that many of the component parts of cars, planes, or similar complex units are fabricated in many different plants, the potential market opened by the development of these laminates is large. A single airplane, for example, may require the preparation of hundreds or even thousands of drawings, modifications, etc., which must be supplied to the tooling departments of hundreds of sub-contractors and sub-sub-contractors. The new laminates, doubling as a drafting medium or as a photographic medium, bring economy, accuracy, and convenience to these operations.

Prior to the adoption of the glass cloth templet materials, many industries relied primarily upon painted metal sheets as a drafting medium for detailed full-scale drawings of component parts. Although these sheets were dimensionally more stable than either paper or vellum, they also had several obvious limitations. Since the sheets are often as large as 4 by 12 ft., they are, of course, difficult to ship and, since they are opaque, they are also difficult to reproduce. Projection photography, the one method by which the drawings can be reduced in size onto a glass negative and then re-projected back to original size on another metal sheet, is an expensive process that requires cumbersome production equipment and skilled operating personnel.

Contact Printing

With the introduction of the specially processed fibrous glass-laminates, these problems have been resolved. The flexible laminates are easier to handle and ship and have an extremely low coefficient of expansion. Since they are transparent and can transmit up to 80% of light, drawings made directly on the surface of the laminate can be reproduced on any other sensitized surface—glass cloth, metal, wood, etc.—by the simple and economical method of contact-printing. Where a drawing is to be reproduced on a metal templet, for example, the laminate is simply held in contact with the sensitized surface of the metal and light is passed through it.

Similarly, when an original design is received on a metal plate, duplicate prints can be made by placing a laminate, coated on one side with a photo-sensitive emulsion, in contact with the metal plate and passing light through the laminate.

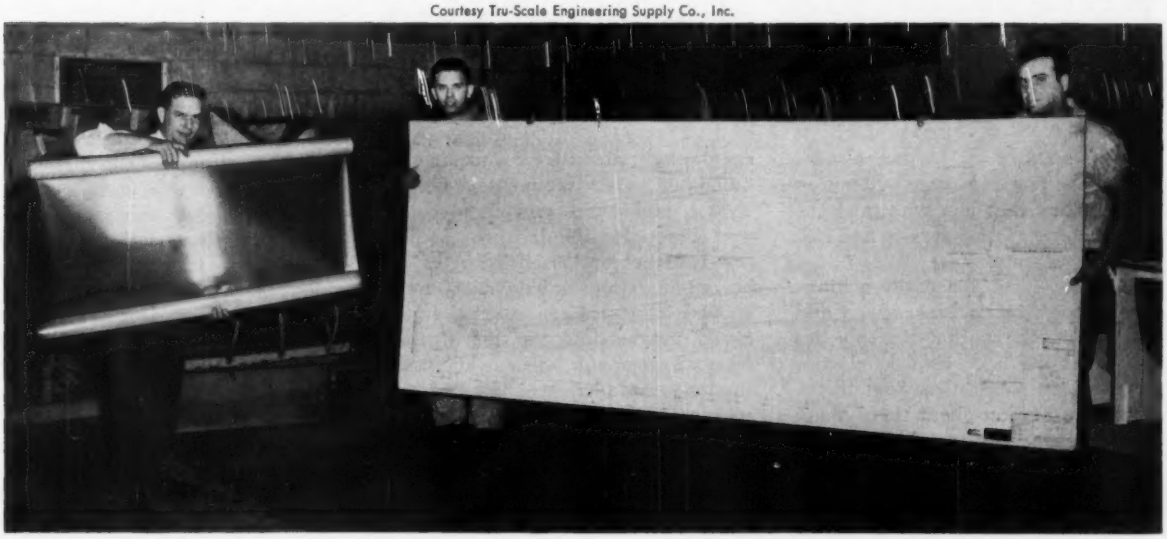
Continuous rolls of the laminate are supplied by companies such as Tru-Scale Engineering Supply Co., Inc., Wichita, Kan., to manufacturers of finished drawing materials, who treat the material and then sell it to the industry. Eugene Dietzgen Co., Chicago, Ill., for example, a major supplier of the laminate, coats the material with a base lacquer and then adds any photo-sensitive coatings and emulsions that might be necessary.

The laminate is sold as precut sheets or in continuous rolls, 36 and 48 in. wide. It is also available in a variety of forms and textures—single ply, double ply, matte surface, etc.—to meet the specialized demands of the variety of industries that have found the laminates to be a useful, economical tool.

CREDITS: Suppliers of basic fibrous glass-polyester laminate includes Swedlow Plastics Co., Youngstown, Ohio and U. S. Rubber Co., Mishawka, Ind.

Transparent fibrous glass-polyester laminate drafting sheet (left) permits contact-print reproduction, can be rolled up for easy handling. Opaque metal drafting medium (right), same size as glass-plastic sheet (4 by 12 ft.), can neither be rolled up nor contact-print reproduced

Courtesy Tru-Scale Engineering Supply Co., Inc.



Photos courtesy Creative Plastics Corp.

Sheaths for new surface level are prepared for compression molding by surrounding glass bubble vial in the mold with acrylic resin

Styrene frame, into which sheath will be inserted, is molded separately. To correct distortion, bottom of frame is sanded flat (above)

Molded for Precision

Success of 24-in. surface level, molded of styrene and acrylic, opens new segments of the hardware market to plastics

IN the form of molded tool handles and housings, plastics have enjoyed the respect of the hardware field for many years.

Now, with the introduction of an all-plastics 24-in. surface level, a new segment of the hardware market is opening to plastics—precision applications that can withstand the rough abuse of shop service and still remain accurate.

The new level is actually a king-size version in its basic shape and design of the pocket-size plastics level and the 9-in. torpedo plastics level which were introduced to the hardware market about three years ago. The production of this 24-in. model, however, because of its size, raised many new problems in materials selection, molding, and assembly that required many months of intensive research before satisfactory solutions were found.

The 24-in. frame of the level is a one-piece styrene molding. Because of the necessity of preventing warpage, brought about by weather conditions or rough treatment, a high-impact, high-heat resistant styrene was chosen for the job.

A surface level, consisting of a horizontal glass bubble vial embedded in acrylic, is inserted in a cavity molded-into the top of the frame. Two plumb levels, which are similarly made by embedding vertical glass bubble vials in acrylic, are installed in two molded-in openings at either end of the frame.

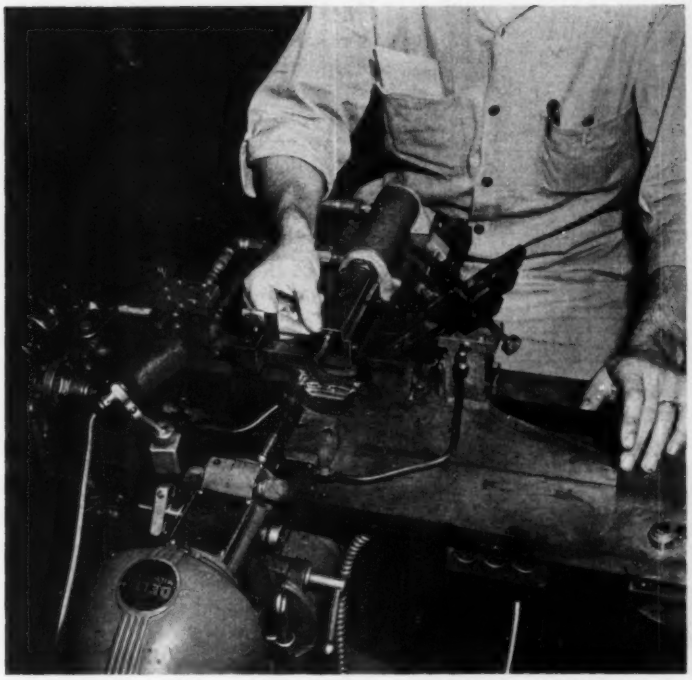
The completely assembled level weighs only 12 oz.—2 oz. less than a wooden model, 7 oz. less than a magnesium model, and 12 oz. less than an aluminum level. Despite its lightness, however, the level is a rugged tool—to such an extent, in fact, that the manufacturers are marketing the level with a "shatter-proof guarantee" that offers free replacement of the unit if it is broken in normal use.

Because the heat-resistant styrene does not absorb or lose heat rapidly, the level remains pleasant to the touch in summer or winter. In addition, weathering tests conducted by the manufacturer have shown that the frame will not warp or craze after prolonged exposure to the elements.

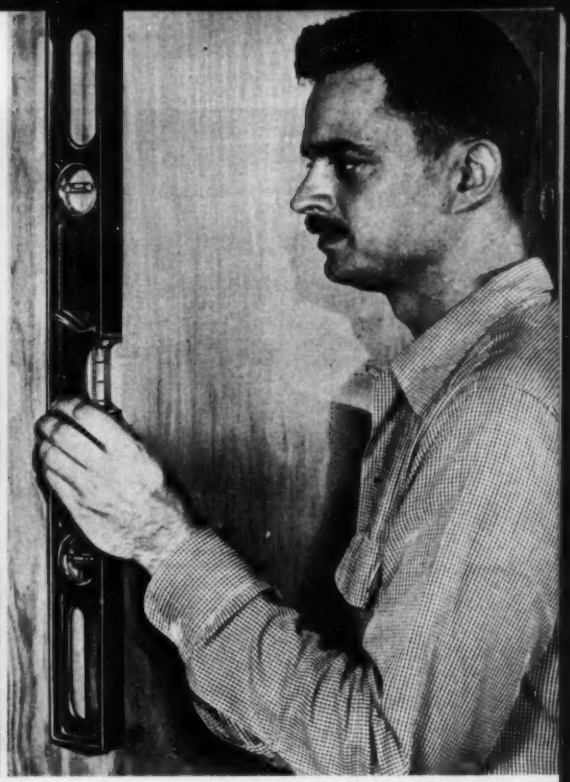
Versatility

Because of its versatility, the new level appeals to many specialized trades. Electricians appreciate the fact that the level does not conduct electricity; masons, the fact that the level will not scratch tile nor will cement adhere to it; and plumbers, the fact that the surface of the level will not corrode when exposed to water or chemicals.

Another practical advantage is offered by the acrylic sheaths. They



Sheath is then slipped into molded-in cavity on top of frame and is locked in place. Holes are drilled through the assembly and dowels are inserted to pin parts together



Plastics level—lightweight yet rugged—can withstand rough abuse of shop service and still remain accurate

are so molded as to magnify and clearly define the bubbles in the glass vials so that they can easily be read from any angle and under poor visibility conditions.

Molding the Frame

The one-piece frame of the level is injection molded in a single-cavity mold with a very large gate in the center and a cold slug or reservoir opposite the gate. Because of the size of the level, it was felt that a mold of this type would result in a molded frame as free from strains as possible—an advantage which would offset the extra finishing costs necessitated by the large gate for this molding operation.

After a molding cycle of 76 sec., the frame is removed from the mold. As it cools, the frame shrinks toward the center, causing a 1/16-in. buckle on the bottom edge.

To correct this one-sided distortion—the top of the frame remains perfectly flat during cooling—the bottom of the frame is sanded down. A simple horizontal sanding fixture was constructed for this operation, using an 8-in., 100-grit belt on a wet sander. The frame is laid on its side, the flat top flush against a bar and the uneven bottom pressed against the sanding machine.

Dial indicator tests taken on the frame after sanding indicated a total variance in thickness that ranged only ±0.002 in. from top to bottom along the entire length of the level —an accuracy far superior to wooden levels and the equal of the finest aluminum or magnesium levels being used today.

Ethyl acetate or ethylene dichloride wiped over the sanded area gives a lustrous finish to the surface of the level.

Inserting Acrylic Sheath

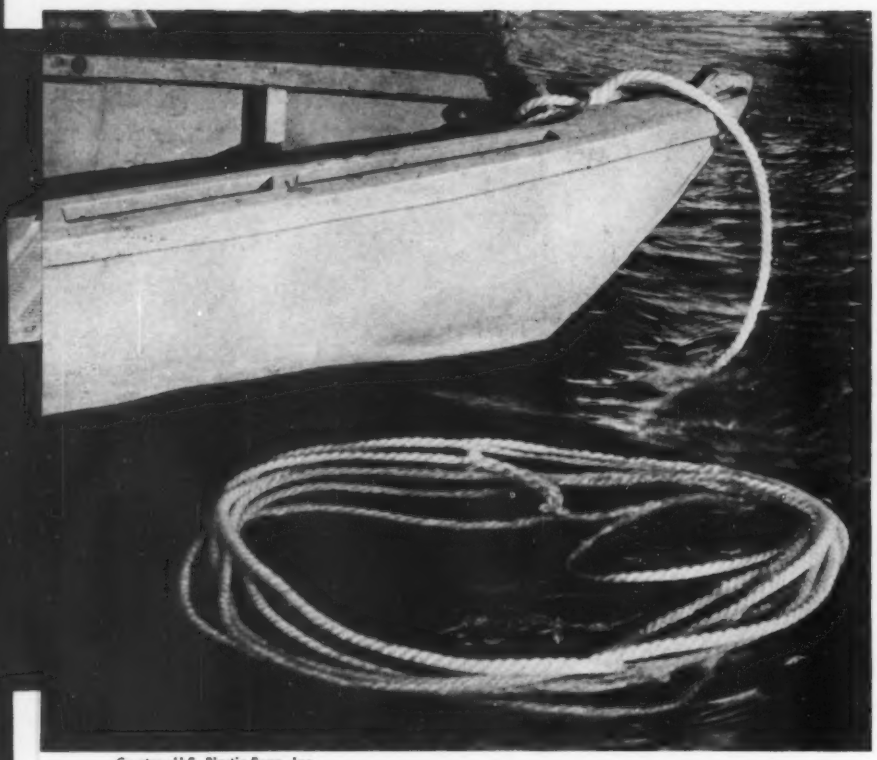
The acrylic sheaths containing the glass bubble vials are compression molded separately in a series of single-cavity molds. In order to embed the vial in the sheath, the mold is first half-filled with acrylic molding powder and the vial is positioned by hand on top of the mound of powder. The glass vial is then completely covered with additional acrylic resin and the entire unit is compression molded. When the sheath is removed from the mold, it is simply deflashed and is ready for assembly.

Instead of following the conventional practice of cementing a surface level into a tongue-and-groove cavity in the frame, the sheath for the 24-in. model is fitted into a molded-in cradle-like cavity on top of the frame and held in place with a pair of dowels. These dowels, which run horziontally through the frame and the sheath, serve a double purpose. They prevent the sheath from popping out of the frame if the level is accidentally dropped and they make it possible to effect 100% salvage of the level in the event that it fails to pass inspection for accuracy. If a level should be rejected for such a reason, all that is necessary to do to salvage either sheath or frame is to force out the dowels and separate the two sections, which can then be used again.

To insert the dowels, a ground-plate table was built. When the frame and sheath are ready for assembly, the frame is slipped between two ground-plate retainers mounted on the table. Three air cylinders, which are controlled by the operator of the machine, push the frame firmly against both the side and bottom retainer plates.

The acrylic sheath is then slipped

(*Continued on p. 192*)



Courtesy U.S. Plastic Rope, Inc.

Bouyant plastic ropes made from twisted-spun-laid polyethylene film are especially adaptable for use in civilian or military marine operations

THE beginnings of fiber rope-making are lost in antiquity; the beginnings of plastics rope-making, which first reached volume production in 1953, date back only four to five years.

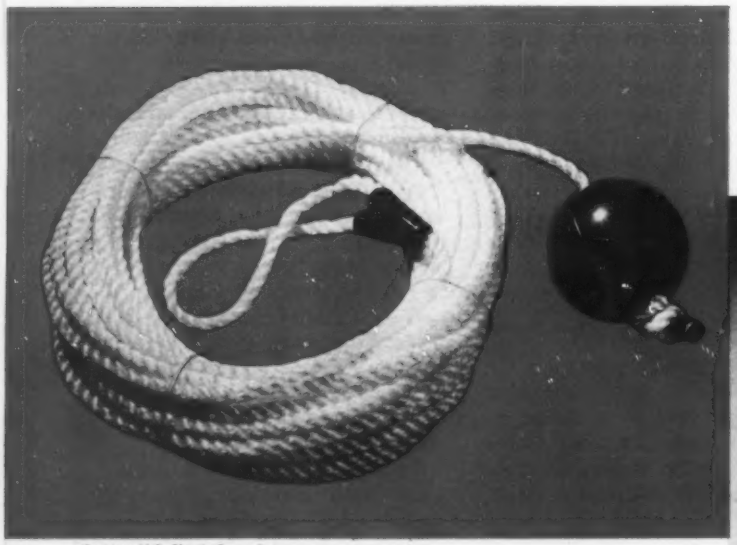
Yet, plastics rope has already begun to challenge fiber rope in a variety of specialized applications, particularly where buoyancy, light weight, chemical and weathering resistance, color, and flexibility at low temperatures are required.

Polyethylene Rope

Because there are no hard-and-fast limitations as to the type of plastic that can serve as a base material, the physical and chemical properties of the new ropes can be varied to meet many different conditions. The final decision as to the end uses of a plastics rope depends on whether polyethylene film is used as a base, or polyethylene monofilaments, or saran film, or polyester film.

Polyethylene, however, because of its many excellent properties and

Plastics



Courtesy U.S. Plastic Rope, Inc.

Typical heaving line produced from polyethylene film not only floats, but is impervious to salt water, fungus, and mold

Polyethylene rope is also made by spinning extruded monofilaments into strands and closing the strands into finished rope

favorable cost, seems destined to be the bulwark of the infant plastics rope industry. Volume-wise, it is already far in the lead over other types of plastics ropes.

There are two basic methods of producing polyethylene rope. In the first of these—a development of U. S. Plastic Rope, Inc., Redwood City, Calif.—a ribbon-like form of polyethylene film is first elongated and spun into thin threads which are then twisted into strands and finally closed or laid into the finished rope. In the second production method, as exemplified by the job being done by Multi-Tex Products Corp., Newark, N. J., extruded polyethylene monofilaments, instead of film, are spun into strands and closed into rope.

Both methods are continuous. Of the two end products, however, the rope produced from polyethylene film is claimed to have a greater tensile strength than the spun monofilament rope. U. S. Plastic Rope rate the strength of their product at 1500 p.s.i.

Conversion of polyethylene film into rope consists, basically, of elongating the film, slit into ribbons, by means of special production machinery and then twisting or spinning it into thread. In this process, the film is fed into the machine from rolls of material slit to the desired width; as the thread emerges, it is rewound onto spools. Continuity is attained at the threading stage by tucking the ends of the film ribbons together for a neat splice.

Threads from several spools are then twisted into thicker and stronger strands. During this operation, close inspection is necessary to make certain that no two points where the film ends have been joined are positioned next to each other in the strand. Finally, two or more of the strands are twisted together to form the finished multi-strand rope.

Spun polyethylene film rope is available from U. S. Plastic Rope in solid colors as well as two-color combinations, in standard coil lengths, and in all regular rope diameters from ⅛ to 1 inch. Larger diameters can be made on request by varying the number of threads per stand. A standard ½-in. diameter rope, for example, contains as many as 45 separate thread units.

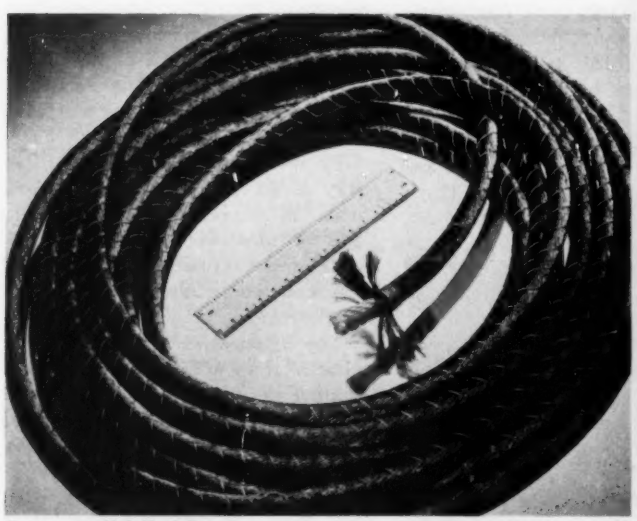
Applications

According to U. S. Plastic Rope, "no one knows yet where the list of uses for spun polyethylene film rope begins or will end."

At the present time, the largest

A variety of thermoplastic films and monofilaments are being made into ropes having unusual qualities; new markets are constantly being opened

Learn the Ropes



Photos courtesy U. S. Plastic Rope, Inc.

Plastic rope spirally covered with strands of fine copper conductor wire serves as a cable intended for use in high-voltage applications

Using colored polyethylene film, safety mark-off ropes can be made in two-color patterns with a high degree of visibility

volume market for the rope is in marine applications, including both civilian and military. The excellent buoyancy of polyethylene—its water absorption factor is a mere 0.0005% and its specific gravity is 0.92—contributes to the usefulness of the ropes as heaving lines, life lines, dinghy lines, and mooring lines. In addition, the new ropes are unaffected by brackish or salt water, are impervious to fungus, mold, and rot, and weigh 30% less than natural fiber ropes of comparable diameter.

These same characteristics, particularly the flotation properties, have also opened a market for spun film rope as mark-off rope for wading areas and as racing competition lines in swimming pools.

As safety barrier ropes, the colored polyethylene ropes have a high degree of visibility, can be wiped clean with a damp cloth, and, unlike the traditional sash rope, are not subject to fraying.

In the furniture field, the resistance of polyethylene to mold, rain, and sun has induced manufacturers to capitalize on the ropes for outdoor furniture applications—functionally, as webbing for the seats and backs of chairs, and decoratively, as trimming for outdoor furniture pieces.

Finally, the industrial field is also finding new uses for the material. One major oil company recently placed the spun film ropes in general yard service at one of their refineries. Since substantial amounts of sulfuric acid are a by-product of the petroleum refining process, the natural fiber ropes previously used had an extremely short life under such conditions. The polyethylene rope, in contrast, is stated to show almost total imperviousness to the destructive acid.

To make rope, polyethylene film is first elongated and spun into thread
Courtesy U.S. Plastic Rope, Inc.

Spun Monofilament Rope

The rope manufactured by the second method of production—twisting monofilaments into the finished rope—is indicative of the high degree of specialization in end-use applications of plastic rope.

According to Multi-Tex Products Corp., their spun filament rope is produced exclusively for use as a mark-off or barrier rope. This application includes both the roping off of danger areas on road maintenance jobs or in industrial plants—particularly those areas where corrosive chemical fumes would affect natural fiber ropes—and marking off sections of golf greens or swimming pool areas.

In line with this specialization in end-use application, the rope is produced in only two contrasting color schemes—red and white and black and yellow—to match the conventional colors used to indicate dangerous areas in industrial plants, or on road maintenance jobs.

The filaments that are to form the finished rope are extruded by Multi-Tex 12 to 24 at a time, depending on the die used. After cooling, the filaments, which are approximately 0.024 in. in diameter, are wound directly from the extruder onto a spool. The spools of filament are then fed into a spinning machine where 18 filaments are twisted together into a single strand. Three strands, similarly twisted together, form the finished rope. A temperature control process sets the twisted polyethylene filaments in place so that they will not unwind.

The finished rope is coiled into hanks for sale. Each hank contains about 200 to 250 ft. of rope and weighs between 2 and 3 pounds.

Polyester Film Rope

Another plastic rope that has attracted much attention is made by U. S. Plastic Rope, Inc., from Mylar polyester film, using the same technique as for the polyethylene rope.

Tensile strength of the polyester film before processing is rated at 25,000 p.s.i. Since the film gains additional strength when spun into rope form, company officials are convinced that tests now under way will prove the polyester film ropes to be at least competitive to fiber ropes in strength. In addition, the polyester rope has the added advantage of remaining flexible and stable over a temperature range of from −60 to 150° C.

Among the first users of the polyester rope have been radiation laboratory scientists. Exact uses of the product are, of course, cloaked in secrecy, but it is known that the dielectric strength, stability, and behavior under extreme heat conditions of the rope are the key factors in its use.

U. S. Plastic Rope has also experimented with a special plastic film formulation that is spun into a rope core for a Litz cable. As a core for this type of cable, which is used for high voltage applications in the 30- to 300-kc. range, the plastic rope is spirally covered with strands of fine copper conductor wire. The plastic rope, by virtue of its stability under heat, has proved ideal for the application.

The Future

As far as applications for the spun polyethylene film rope are concerned, the surface has just been scratched. Still awaiting exploitation are the light weight of the material and its ability to remain pliant at temperatures as low as −70° F. And once the stretch factor inherent in the polyethylene rope has been reduced, clotheslines will offer another tremendous market.

Polyester rope also has a long way to go. If strength tests prove what is expected, polyester rope will be ideal for a variety of applications, particularly in areas of unusual temperatures such as the arctic regions.

The application possibilities for plastics ropes of all kinds are continuing to multiply as more and more industries become aware of the specialized advantages the materials have to offer.

CREDITS: Polyethylene film and resin and Mylar polyester film supplied to U. S. Plastic Rope, Inc., and Multi-Tex Products Corp., by E. I. duPont de Nemours & Co., Inc., Wilmington, Del.

'Wounded' Manikin that Bleeds

AS CLOSE to the real thing as possible without actually blasting a human being, a "wounded" manikin molded of reinforced plastics serves as a demonstration model for teaching first aid to military personnel. Covered in part with a vinyl plastisol skin that is almost human in appearance and feel, the life-size manikin was built by the U. S. Navy to simulate victims of catastrophe.

Complete with open gashes and tears and capable of bleeding in a life-like manner, the model is used by the Navy to teach the proper treatment for six of the casualty problems most commonly encountered in an emergency. These problems, each of which can be demonstrated dramatically on the manikin, include a leg wound, an arm wound, an abdominal wound, a penetrating chest wound, choking caused by a foreign body in the throat, and a fractured jaw.

In each case, accepted first-aid care, when properly applied, will actually bring the "dying" manikin "back to life" by stopping the loss of blood.

Reinforced Plastics Body

Since the figure and the base on which it rests are molded in one piece, the basic body of the manikin, although it appears to be rounded, is actually only a three-dimensional relief profile rising from the base.

The body and base are molded in one piece in a multiple-part plaster female mold cast from a sculptured clay model. As the first step in the production of the manikin, the interior of this mold is coated with a parting agent and then with a polyester resin. Both coatings are brushed into the mold by hand.

Over these coatings, successive layers of resin-impregnated fibrous glass cloth and mat are laid up by hand until the desired thickness has been reached. To retain detail in the more complex parts of the manikin, such as the hands and face, small pieces of very fine glass cloth are carefully fixed in place around nose, eyes, mouth, and fingers before the coarser grades of fibrous glass cloth and mat are laid up.

Curing of the lay-up is carried

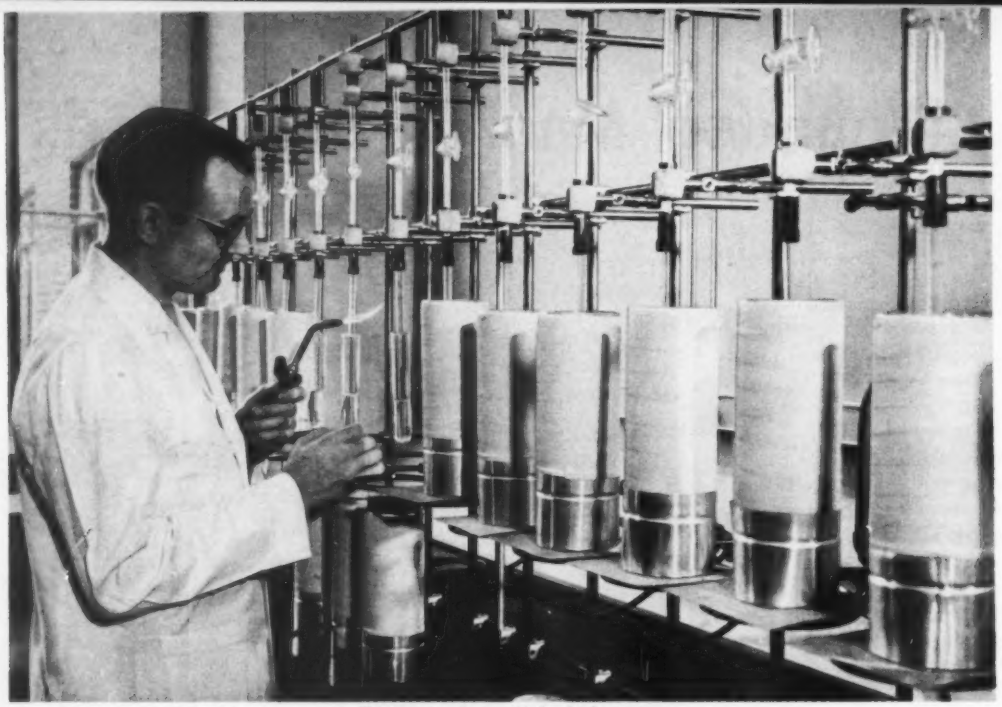
(*Continued on p.* 195)

Abdomen 'skin' section, molded of vinyl plastisol, is used by sculptor as a guide to shaping clay model from which plaster mold for reinforced plastics 'body' is cast

Official U. S. Navy Photos

Pressure of tourniquet stops flow of 'blood' from simulated arm wound by closing the tube through which the liquid is pumped

Fingers can be inserted into the flexible vinyl mouth of the manikin to remove foreign objects which are lodged in the throat



Photos courtesy Argonne National Laboratory

In production of plastics scintillators, glass vials containing organic fluorescent material dissolved in liquid monomer are evacuated and sealed prior to thermal polymerization of contents. Above: Sealing off one of the vials

PLASTICS SCINTILLATORS

Casting of specially prepared synthetic material counts intensity of source of radioactivity . . . and identifies it

SCINTILLATION counters are devices used in the detection and measurement of nuclear radiations. For certain types of work they have become a serious challenge to the well-known Geiger counter, because in addition to counting the intensity of an unknown source of radioactivity, they may also identify the exact isotope responsible for the radiations.

Scientists at the Argonne National Laboratory, operated by the University of Chicago as part of the Atomic Energy Commission program, have found that certain plastics materials may be used to advantage in scintillation counters, overcoming various limitations encountered with other materials. Through experimental work conducted by Robert K. Swank and Warren L. Buck of Argonne's Instrument Research and Development Div., reliable methods have been developed for producing efficient plastics scintillators by means of a polymerization casting and fabricating process. One of the most effective plastics materials thus far tested is polyvinlytoluene,* a closely related methyl substitute for regular commercial styrene.

The scintillation counter is a modern version of a very old method of counting radioactive rays. In the original form of this device, the human eye observed and counted the light flashes produced in a fluorescent screen which was irradiated with alpha particles from a radioactive substance. In modern scintillation counters, a more sensitive unit, called a photomultiplier, replaces the human eye and converts the light flashes into electrical pulses. By replacing the microcrystalline fluorescent screen with large single crystals, the scintillation counter can count not only alpha particles, but also beta particles, gamma rays, and neutrons.

At the present time, scintillation counters have been used primarily in laboratories for physical research. Due to their great sensitivity, however, it is believed that they will find increasing use in prospecting for radioactive substances and in monitoring industrial processes involving the use of radioactive materials. The need for such instruments will multiply rapidly as industry assumes a more active role in the development of power and other phases of atomic energy.

Crystal Size

Until recently, the use of scintillation counters was limited by the difficulty of obtaining single large crystals of sufficient size to provide the desired sensitivity.

As a result of the work conducted at Argonne by Swank and Buck, the laboratory is now able to pro-

*Vinyltoluene monomer is produced by Dow Chemical Co., Midland, Mich.

duce transparent plastic scintillators comparable in performance to single crystals. One material in particular —a solid solution of terphenyl and diphenylstilbene in polyvinyltoluene —has a very high efficiency and may be produced in large volumes as easily as commercial polystyrene.

Since high transparency is required in the scintillators, oxidation and consequent yellowing of the plastic must be avoided. For this purpose the Argonne scientists have developed methods of purifying the monomer and of achieving carefully controlled polymerization in the absence of oxygen and without the need for peroxide type catalysts.

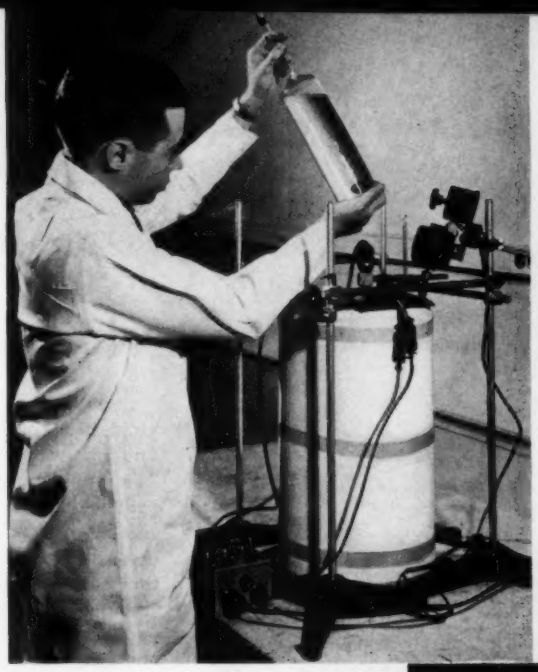
The first step in the production of plastic scintillators consists of purification of the vinyltoluene monomer. Next, small concentrations of one or more organic fluorescent materials, such as terphenyl and diphenylstilbene, are dissolved in the liquid monomer.

The monomer solution is then transferred to Pyrex glass vials of the desired shape and size and the space above the monomer evacuated, after which the vial is sealed and the polymerization process is carried out in a controlled temperature bath.

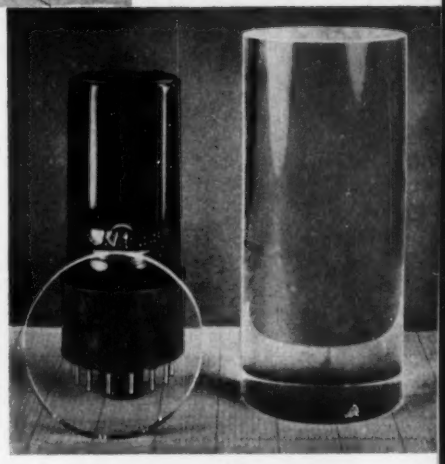
For long rods up to 3 in. in diameter, polymerization is initiated at from 100 to 120° C., then raised to around 140° C. after one or two days. After reaching the peak curing temperature, where the material may be held for a week or longer, temperature is reduced gradually to avoid forming voids in the castings. Following the cooling period, the casting is allowed to remain for 24 hr. just below the softening point for annealing. The glass tubes containing each casting are then plunged into water at the same temperature and the water allowed to cool down gradually, causing the glass and plastic to shrink apart. The glass is removed and the completed plastic casting is then machined to final shape and size. It is believed that, if necessary, the plastic scintillators could be cast to their ultimate dimensions.

In order to detect and measure nuclear emanations, the scintillator and photomultiplier must be used in conjunction with a suitable device for counting or measuring the resulting electrical pulses. The size and complexity of the equipment involved varies greatly with the amount of information required. Illustrated in an accompanying photo is some of the equipment used at the Argonne Laboratory to measure the efficiency of different scintillators using a known radiation source.

The Argonne National Laboratory does not supply scintillators, but has conducted experimental work aimed at finding improved types of scintillators. Several commercial firms are now manufacturing plastic scintillators, including Pilot Chemicals, Inc., Waltham, Mass.; Larco Nuclear Instrument Co., Palisades Park, N. J., and National Radiac, Inc., Newark, N. J.

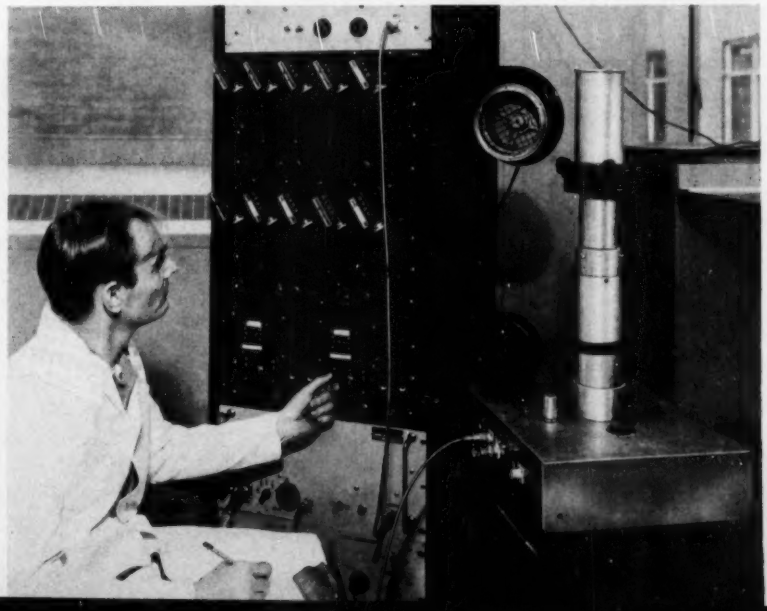


Sealed-off glass vial, containing vinyltoluene monomer solution and organic fluorescent material, is inspected prior to being placed in temperature - controlled polymerization bath



Vinyltoluene scintillator cylinder and disk have high degree of transparency

Electric pulses from photomultiplier, on top of which aluminum-enclosed plastics scintillator is mounted, are examined in pulse height analyzer to check scintillator performance



Four-Channel Combination Hose

Combination sprinkler and soaker hose extruded of vinyl is reported to be the first of its type to insure uniform water pressure throughout its entire length. The four-channel hose is extruded as a single unit. One channel carries the water supply the full length of the hose, the other three channels are perforated and serve as outlets. A brass cap is used to seal the open end of the hose which forces water from the unperforated channel back into the three perforated sections under equal pressure. Turning the unperforated side up changes hose from sprinkler to soaker.

The vinyl hose is made with one side flat to prevent twisting and turning while in use. Special couplings at each end of the hose permit the addition of extra sections. The new coupling also allows the hose to be flushed out in the event of silt accumulation.

Hose is produced on standard extrusion equipment. Perforations are cut by rollers and steel needles.

CREDIT: Manufactured by United States Rubber Co., Mechanical Goods Div., 1230 Sixth Ave., New York, N. Y.

Bathtub-Size Pirate Ship With Crew

Styrene pirate ship that rolls on wheels or floats in water is the latest addition to a line of miniature water toys. The ship is equipped with a dinghy and oars, simulated pirate flag, crow's nest, ladder, walking plank, masts, rigging, hatches, and windows. Also included is a cannon that fires small cannon balls. Six flexible pirate figures in action poses can be placed in various positions on the ship. The anchor and chain form a pull cord for the toy.

The pirates, sails, flag, and rigging are molded of vinyl. The ship, dinghy, mast, cannon, ladder, and small parts are molded of high impact styrene.

Four molds are required to mold the set. Ship is molded on a 20-oz. machine. Cannon, dinghy, and other small parts are molded on an 8-oz. machine. Flag and sails are also molded on an 8-oz. machine. Pirates are molded in a 20-cavity combination mold on an 8-oz. machine.

CREDITS: Molded by Ideal Toy Corp., 184-10 Jamaica Ave., Hollis, N. Y. Vinyl supplied by Bakelite Co., New York, N. Y.

PRODUCTS

Distortion-Free Mirror Clips

Bevelled-edge mirror clips molded of crystal clear or colored styrene and produced specifically for the furniture industry, are molded without disfiguring knockout pin marks. Light can therefore reflect without distortion, through the angular faces of the clip to produce the effect of gem-like faceting.

The mirror clip is mounted to the mirror backing by means of a single screw. Molded directly into the L-shaped unit is a screw hole complete with countersink to accommodate standard mounting screws.

A precision-built 16-cavity mold on an 8-oz. injection molding machine is used for producing the mirror clips. Incorporation of blade-type knockouts in the mold leaves the surface of the clip unmarred. After the shot comes from the mold, the mirror clips are individually degated. High gloss of styrene makes buffing or polishing unnecessary.

CREDITS: Molded by Lurie Plastics, Inc., 1913 Boulevard, Colonial Heights, Va. Styrene is supplied by Monsanto Chemical Co., Springfield. Mass.

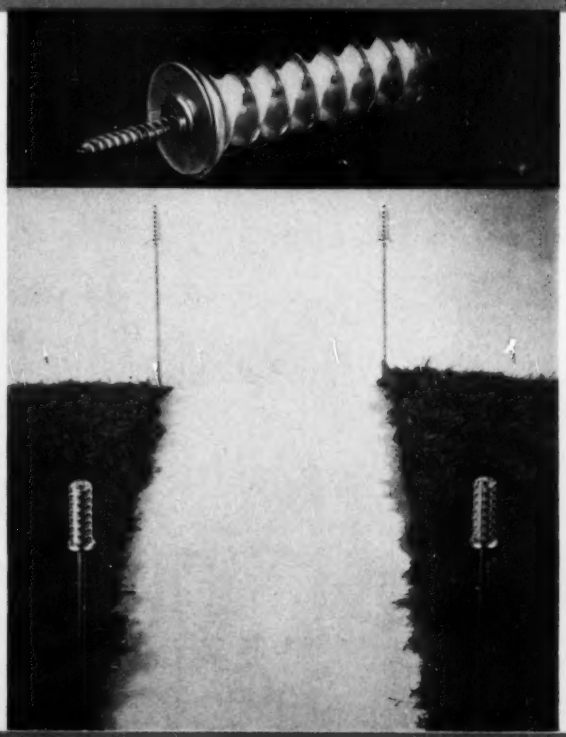
Weather-Resistant Reflector

Light reflecting marker, called Drive-Glo, is visible from any angle. Precut reflective sheeting is rolled and inserted into a hollow molded acrylic cap which is sealed at one end. Tension created in rolling the sheet makes it unnecessary to use adhesives to hold the sheet in place. A brass washer crimped in position at the base of the cap prevents the sheeting from sliding out. Once the washer is secured, the unit is rustproof, waterproof, and weatherproof.

The marker is available as a screw type for mounting on poles or as a stake type fastened to a 36-in. aluminum rod. A molded recess in the top of the cap holds the fully inserted rod in alinement. The screw type cap is open at both ends; a long brass screw passes lengthwise through it. Combinations of both types make mounting possibilities unlimited.

The cap is produced in a four cavity mold on a 12-oz. injection molding machine.

CREDITS: Manufactured by D & G Products Co., 2796 Woodhill Rd., Cleveland 4, Ohio. Acrylic supplied by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.



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Cellular Polyethylene by Extrusion†

by W. T. Higgins‡

Material produced by use of thermally sensitive blowing agent offers many advantages in electrical applications

SINCE its development ten years ago, polyethylene has been found useful for many applications. The first, and still one of the largest of these, is electrical insulation. Its good mechanical properties, low moisture absorption, high resistivity, and low-loss characteristics make it ideally suited for this use. For certain applications requiring low-loss behavior beyond that of solid polyethylene, a material capable of being foamed to a cellular form has been developed by the Bakelite Laboratories and is now available for industrial and commercial applications.

By combining polyethylene having a dielectric constant of 2.3 with a blowing agent which yields an inert gas having a dielectric constant of approximately 1.0, a composition of matter having a constant between these two values is obtained. Normal extrusion equipment does an excellent job and only a few changes in conventional operating procedure are necessary to produce a good product.

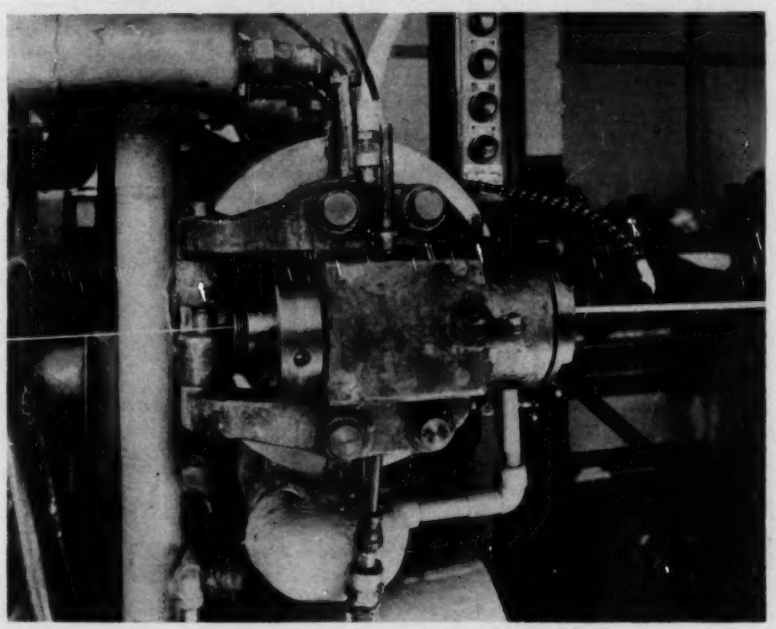
Blowing Agent

This new cellular polyethylene is made by techniques which produce an intimate dispersion of a chemical blowing agent in polyethylene resin. The blowing agent is a thermally sensitive chemical which liberates gas at a specific temperature. The correct choice of the blowing agent for an electrical end-use product is a critical one and it must meet several unusual requirements. For example, the blowing agent itself, the gas it liberates, and the residue product must not absorb moisture because water is detrimental to good electrical properties. It is desirable that the residue left after the blowing agent has expanded be non-polar to prevent the occurence of losses at high frequencies. This is the ideal situation; but it is not always possible to use a blowing agent which leaves a non-polar residue. Therefore, the blowing agent used should liberate large volumes of gas and leave as little residue as possible.

The blowing agent must be made to liberate its gas under controlled conditions. So far, cellular polyethylene has been produced most satisfactorily in an extruder. Other methods of forming the material are under investigation but because it is possible to maintain pressure on the material constantly in an extruder, such equipment is most readily adaptable to provide the controlled conditions required during the liberation of the gas.

Aside from its normal operation, the extruder used for this purpose must perform two additional functions. The first is to cause the blowing agent, by application of heat, to

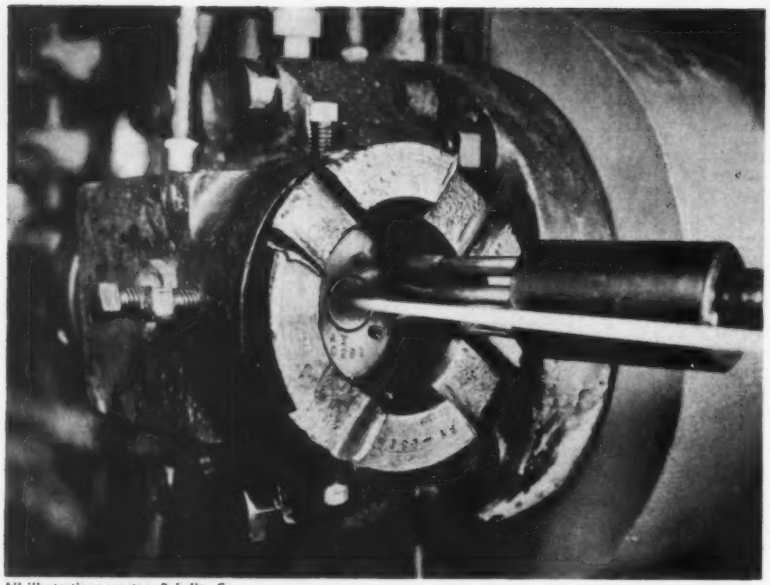
Bare wire enters extruder crosshead from left and emerges at right coated with cellular polyethylene. Wire should be preheated to 100 to 125° C. to insure smooth surface



* Reg. U. S. Pat. Off.

† Adapted from a paper presented at the Signal Corps Symposium at Asbury Park, N. J.

‡ Development Dept., Bakelite Co., a Div. of Union Carbide and Carbon Corp., Bound Brook, N. J.



All illustrations courtesy Bakelite Co.

Close-up of die, showing emerging wire coated with cellular polyethylene. Because of material expansion during extrusion, die size should be calculated as described in text

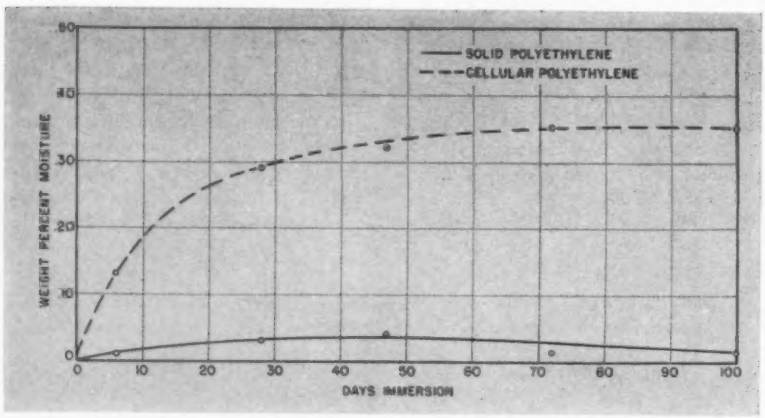


Fig. 1—Moisture absorbed vs days of immersion in tap water at 23° C.

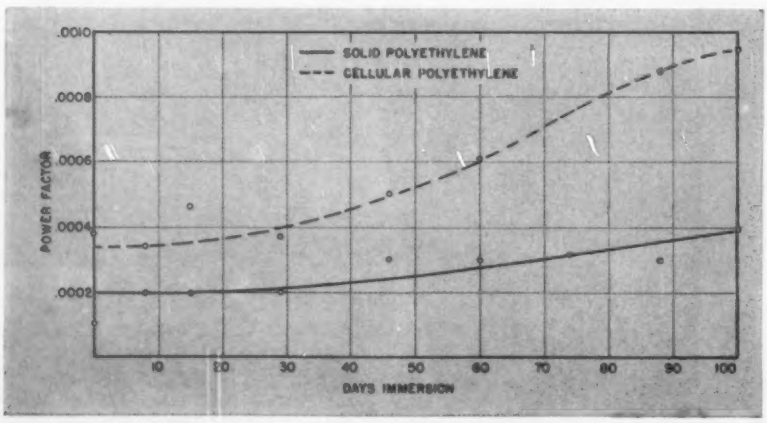


Fig. 2—Power factor at 1 megacycle vs days of immersion in tap water at 23° C.

liberate the gas. The second is to maintain sufficient pressure in the barrel, head, and die to prevent expansion of the liberated gas before it emerges from the die. When the machine is performing correctly, the product has a smooth surface, a uniform bubble size, and a unicellular structure.

Machines having a screw length-to-diameter ratio of 12 to 1 or better have been found more effective than extruders having lower ratios. The best machine conditions are those which give the lowest density at the lowest compound temperature. To determine the optimum conditions for a particular extruder, it is recommended that the barrel and head temperatures be set at 300 and 250° F., respectively, and the density of the product measured. The barrel and head temperatures should then be raised in 25° F. increments until a product density of 0.47 is achieved. Operating temperatures higher than necessary will give less uniform bubble size and rougher surface, and will increase the difficulties encountered during the cooling cycle.

Several other factors, which are not normally encountered, must be considered in the production and extrusion of cellular polyethylene. To insure pressures in the barrel sufficiently high to prevent premature expansion of the gas, a dense screen pack is needed. Screen packs of 20/60/100/100-mesh screens have been effective. Head and die pressures are kept high by using a low head temperature and a die designed to restrict the flow of the material; that is, as the annular opening between the wire or core and the die increases it is necessary to increase the die land length to prevent expansion. The exact length will vary with the machine and the optimum operating conditions. Premature expansion makes itself apparent by die plating or curling of the compound on the face of the die. This is accompanied by a rough surface on the extruded material.

When properly extruded, cellular polyethylene will expand 100%, or to double the volume of the unexpanded material. Therefore, when coating wire, for example, the area of the die opening with the wire in the die must be 50% of the area of the finished insulation. A convenient formula for computing the final di-

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ameter for a given die size or the die size from the final diameter for a circular cross section is

$$D = \sqrt{2D_1^2 - d^2}$$

where D = final diameter, D_1 = die diameter, and d = diameter of wire or core.

The screw temperature should be maintained at approximately 212° F. Lower temperatures result in uneven heating while higher temperatures cause the compound to stick to the screw and reduce output. High compression ratio screws have been slightly more effective than those having a low compression ratio.

To insure a smooth, regular surface when wire coating, the wire should be preheated to 100 to 125° C. Lower temperatures give a lumpy product while higher temperatures result in erratic cooling and flattening of the insulation.

The cooling of the finished wire is often difficult. For thin wall insulations, direct water cooling is possible. Where heavy walls are involved, a long stretch of air cooling is desirable. If the product is quenched too rapidly it will flatten due to the weakness of the extruded coating at the extrusion temperature. Rapid contraction of the occluded gases before the polyethylene has developed strength, contributes to the deformation of the insulation. Both these tendencies are minimized by using the lowest possible compound temperature.

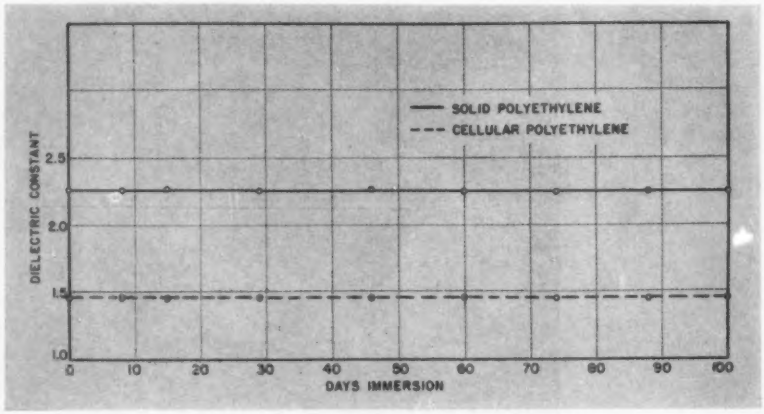


Fig. 3—Dielectric constant at 1 megacycle vs days of immersion in tap water at 23° C.

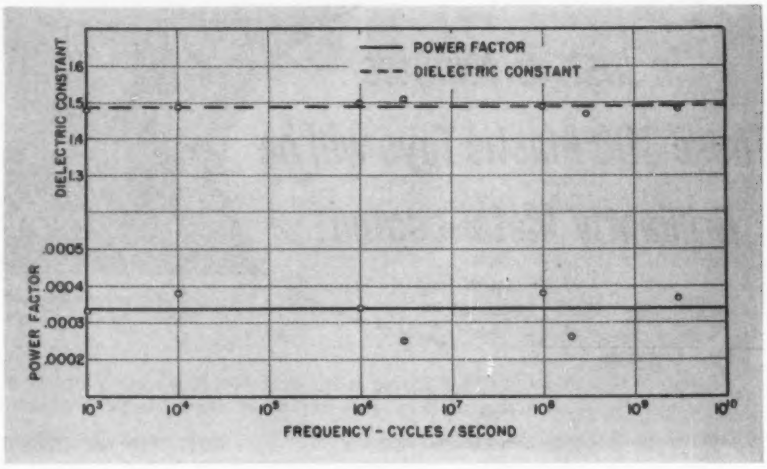


Fig. 4—Power factor and dielectric constant of cellular polyethylene vs frequency

General Properties

Because cellular polyethylene is 50% gas, it can easily be predicted that certain properties of the polyethylene will be degraded while others will be improved. Table I illustrates the effect of the gas on some of the common properties of polyethylene.

It should be noted from the table that the tensile strength, elongation, and dielectric strength of the cellular composition are degraded when compared with solid polyethylene but are still in a range which permits use of this compound in many applications. The power factor values are essentially the same. The dielectric constant is very much lower and hence the cellular material exhibits lower losses than the solid polyethylene. The very low density is desirable where reduced cost and weight are important.

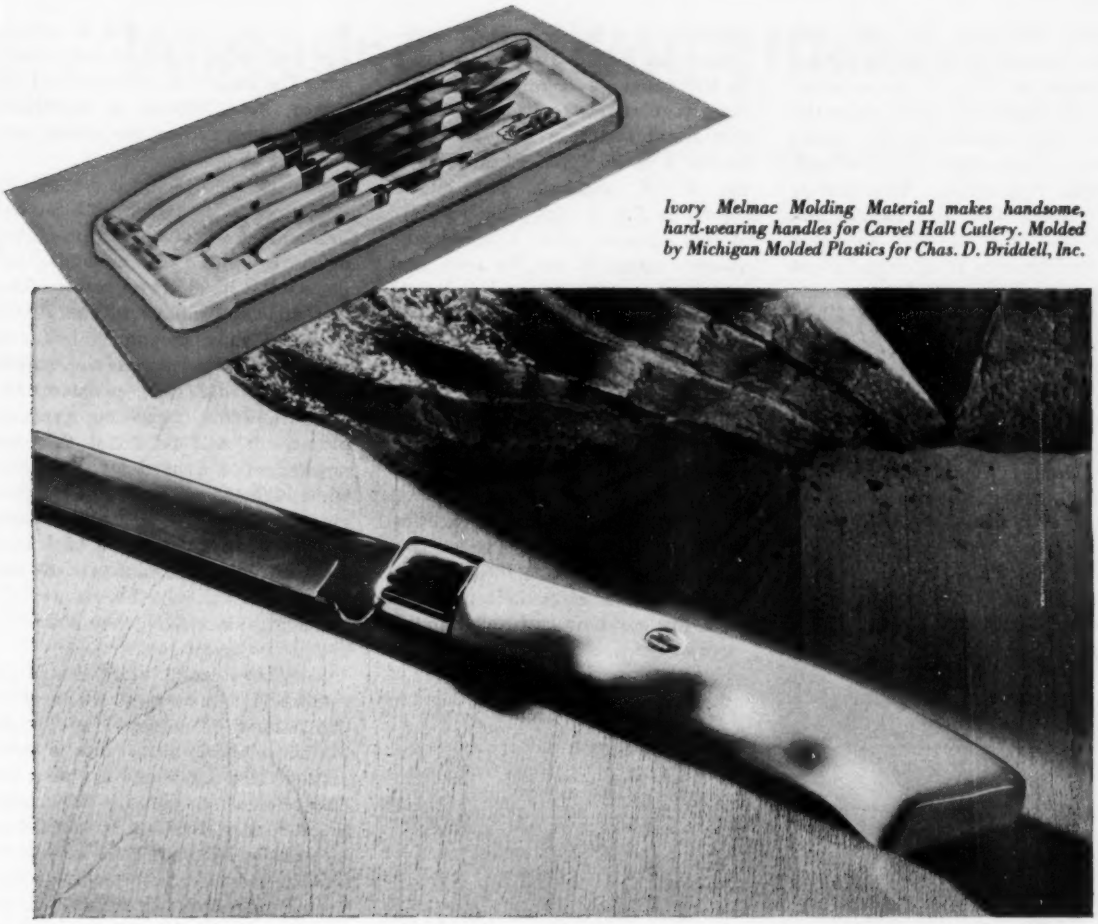
Table I — General Properties of Cellular Polyethylene

	Solid Polyethylene	*Cellular Polyethylene*
Wire size #14 A.W.G. insulation O.D. (in.)	0.250	0.250
Tensile strength, p.s.i. @ 23° C.	2180	670
Elongation, % @ 23° C.	580	310
Dielectric strength, A.S.T.M. D-149-44		
Short time @ 0.125 in.	630 v./mil	220 v./mil
Step by step @ 0.125 in.	590 v./mil	190 v./mil
−55° C. Mandrel bend, 2×	OK	OK
Specific gravity	0.92	0.47
Power factor @ 1000 cycles	0.00028	0.00033
10,000 cycles	0.00030	0.00038
Dielectric constant @ 1000 cycles	2.3	1.48
10,000 cycles	2.3	1.49

Moisture Absorption

Cellular polyethylene has a unicellular structure. That is, each bubble or cell is completely enclosed in a shell of polyethylene. Because each gas cell is completely closed, the moisture permeability of this composition approaches that of solid polyethylene.

Figure 1 shows the percentage of



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moisture absorbed by solid and cellular polyethylene samples during immersion for 100 days in tap water at 23° C. Figures 2 and 3 show the effect of this exposure on the power factor and dielectric constant of both materials respectively. This test is quite severe and the results indicate that this material will give good performance in alternately wet and dry environments often encountered.

High-Frequency Properties

An application which requires this moisture resistance is the recently developed cellular polyethylene antenna lead-in wire for ultra-high-frequency television reception. Another requirement for this and other high-frequency applications is that the power factor and dielectric constant should be insensitive to changes in frequency. The presence of irregularities in either of these properties will result in power losses in the range of frequencies where the irregularities occur. In practice this might result in poor reception due to a weak signal in the case of the U.H.F. antenna. The curves shown in Fig. 4 show the behavior of this material over a broad frequency range. It can be seen that both the power factor and dielectric constant show little, if any, response to changes in frequency. This is a desirable situation, because the absence of irregularities in either value means that power losses will be uniformly low.

In many installations contemplated for cellular polyethylene, seasonal temperature changes will be encountered. To minimize power losses it is desirable that there be little change in the power factor or dielectric constant due to temperature changes. The curves given in Fig. 5 indicate that the requirement is very nearly met. The dielectric constant and the power factor remain at essentially the same level over the whole temperature range.

The specific gravity of the cellular polyethylene material will have a pronounced effect on the properties of the insulation. Of particular importance is its effect on power factor and dielectric constant. The curves in Fig. 6 show the power factor to be essentially independent of density while the dielectric constant increases with increasing specific gravity. It will be noted that the power factors given here are somewhat higher than those shown previously. The data for this plot were obtained from specimens of brown material. The colorants used to obtain the brown color have the effect of slightly increasing the value of the power factor.

A higher density than 0.47 may be required for many applications. This can readily be achieved by blending the cellular stock with a solid polyethylene compound to obtain the desired density. While it is possible to get higher densities by extruding at reduced temperatures and thus limiting the extent of blowing, it has been found extremely difficult to reproduce results. In every case it is recommended that all of the gas from the blowing agent be liberated during the extrusion operation.

The unique properties of cellular polyethylene, the economies to be gained by reduction in cable size and weight, and its ease of handling in modern extrusion equipment should prove of great advantage in many electrical applications.

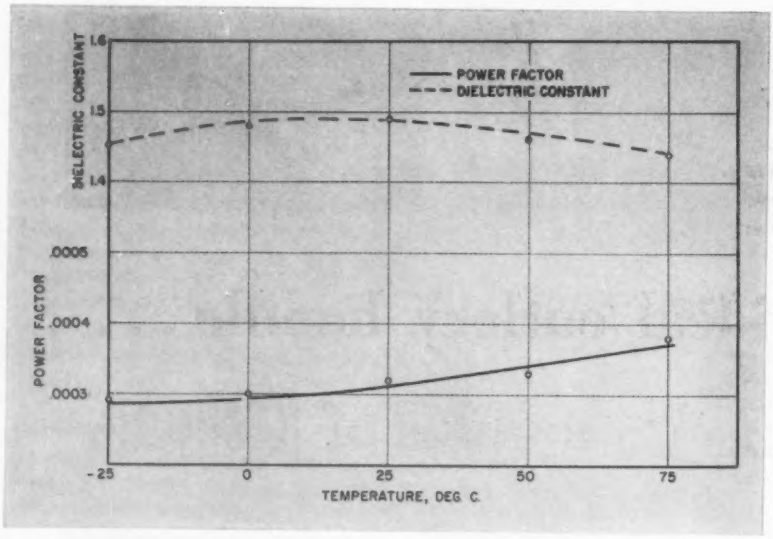


Fig. 5—Cellular polyethylene power factor and dielectric constant at 1 megacycle vs temperature. The small effect of temperature change on these two properties indicates that the material will have minimal power losses when subjected to seasonal variations

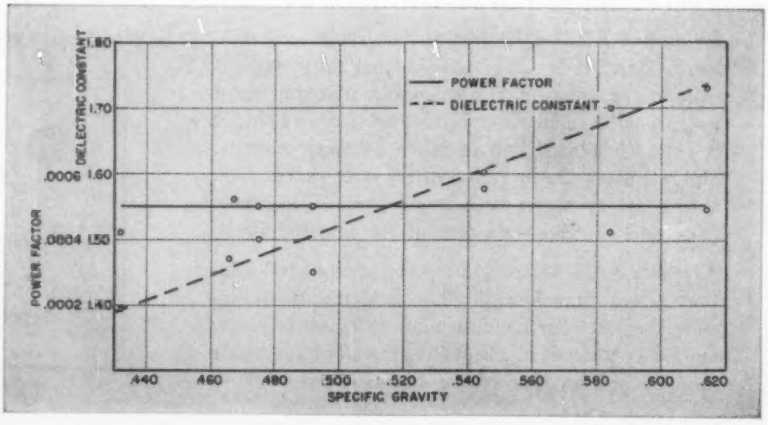


Fig. 6—Plot of cellular polyethylene power factor and dielectric constant at 1 megacycle vs specific gravity shows slight effect of density on power factor but great effect of density on the dielectric constant

Increasing Molding Efficiency

Vertical injection machine improved with new cylinder, automatic controls, and unusual air-operated device for loading the cylinder

FOR over 20 years, a large molder has been doing a "bang-up" job of injection molding on custom built machines. The basic machine design was very similar to a single-ram, upward-acting type of transfer press. A complete description of this equipment, as it was being used a little over three years ago, was given in the August 1950 issue of MODERN PLASTICS magazine.

Since that article was written, the molder, Mack Molding Co., Wayne, N. J., has made many improvements and today the vertical operation of the machines is about the only feature which remains the same. Figure 1 shows one of Mack's largest and most up-to-date machines as of three years ago. Compare this machine with the one in the balance of the photos. The single ram for both clamp and injection has given way to a two ram design—the bottom ram for mold travel and clamp and an overhead cylinder and ram which replaces the stationary injection ram. The injection cylinder no longer travels up and down on a movable bolster plate which required heavy coil-spring "push backs" to push the cylinder away from the ram. Instead, the cylinder remains stationary and the overhead ram does the traveling.

With the old design it was necessary to load the injection cylinder by hand, the press operator scooping the material from a drum and pouring it into the open top of the injection chamber. This operation made it difficult to avoid material contamination and also resulted in a certain amount of lost material. On fast cycling jobs it many times necessitated a longer cycle than would have been required if the time needed for hand loading could have been eliminated.

The new machine design still makes use of "low" pressure for mold closing and "high" (5000 p.s.i. line) pressure for clamping, but the unwieldy hand operated lever (Fig. 1) which actuated the hydraulic valves has been replaced by push buttons which actuate solenoid valves for controlling the machine motions. Timers have also been installed for automatic operation.

Loading Problems

One of the biggest problems which had to be solved before the moving overhead ram could be incorporated into the machine design was that of loading the injection cylinder. The new cylinders were much smaller in diameter than the old and therefore had to be much longer in order to hold an equal amount of material. The reason for the smaller diameter was simply one of sensible machine design. For example, many of the old-style injection rams were 10 in. in diameter. With 5000 p.s.i. line pressure and a requirement of 20,000 p.s.i. injection pressure on the material, it was necessary to use a press equipped with an upward acting 20-in. diameter hydraulic ram and cylinder. Mounting a cylinder of such size on the floor in the base of a machine is standard procedure. But mounting such a massive, heavy piece of equipment upside down on the top of an injection machine would have been little short of ridiculous. Hence the longer, smaller diameter design.

Because of the increased height of the machine, and also because the cylinder does not come down when the mold opens, as in the older design, hand loading of the injection chamber became impractical. Also, because of the problems peculiar to the operation of vertical injection machines, especially in the larger capacities, it was decided that gravity feed would not be satisfactory. This decision, however, was not reached until after several abortive attempts had been made in this direction. The hopper for gravity feed would have to be in some high and comparatively inaccessible location; to be at all practical, some type of auxiliary hopper loading equipment would be required. Although several different types of hopper loaders are now on the market, Mack engineers felt that some better loading method could be devised. Furthermore, they wished to eliminate the problem of bridging of material in the hopper which becomes particularly troublesome when molding shredded reground.

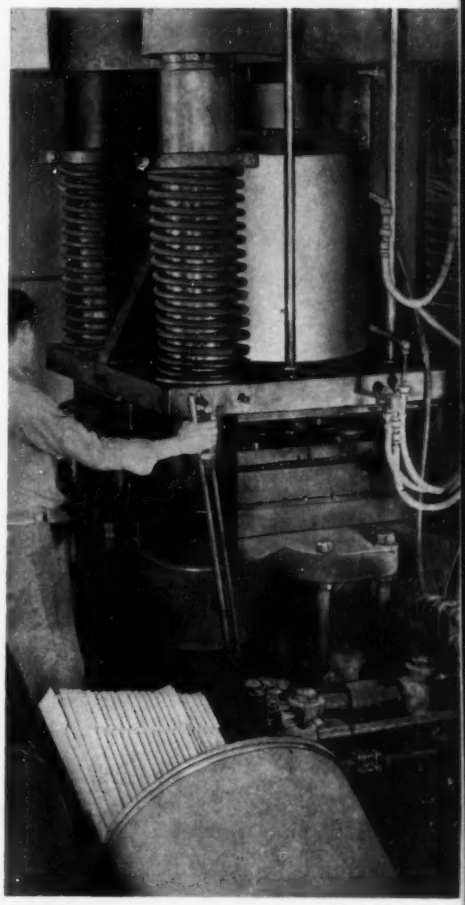


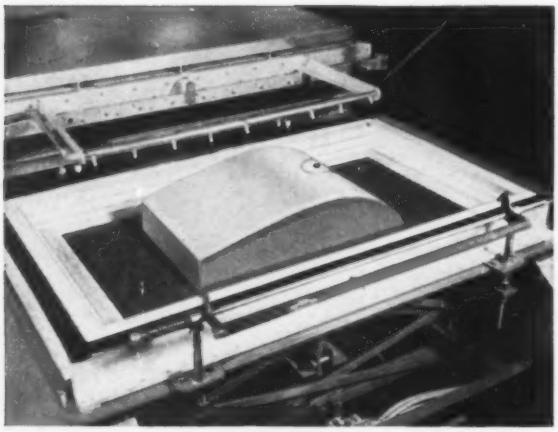
Fig. 1—This machine was modern three years ago. Now see pp. 108 and 110

The method finally devised has been aptly tagged "jet" loading, since it makes use of an air jet to accomplish the desired results. Fig. 2 shows the simplicity of the design;

(*Continued on p. 108*)

TWO NEW DEVELOPMENTS CUT COST OF MOLDED PLASTIC PARTS

Vacuum forming, with STYRON 475 SHEET, *reduces die costs, speeds production of large area moldings*



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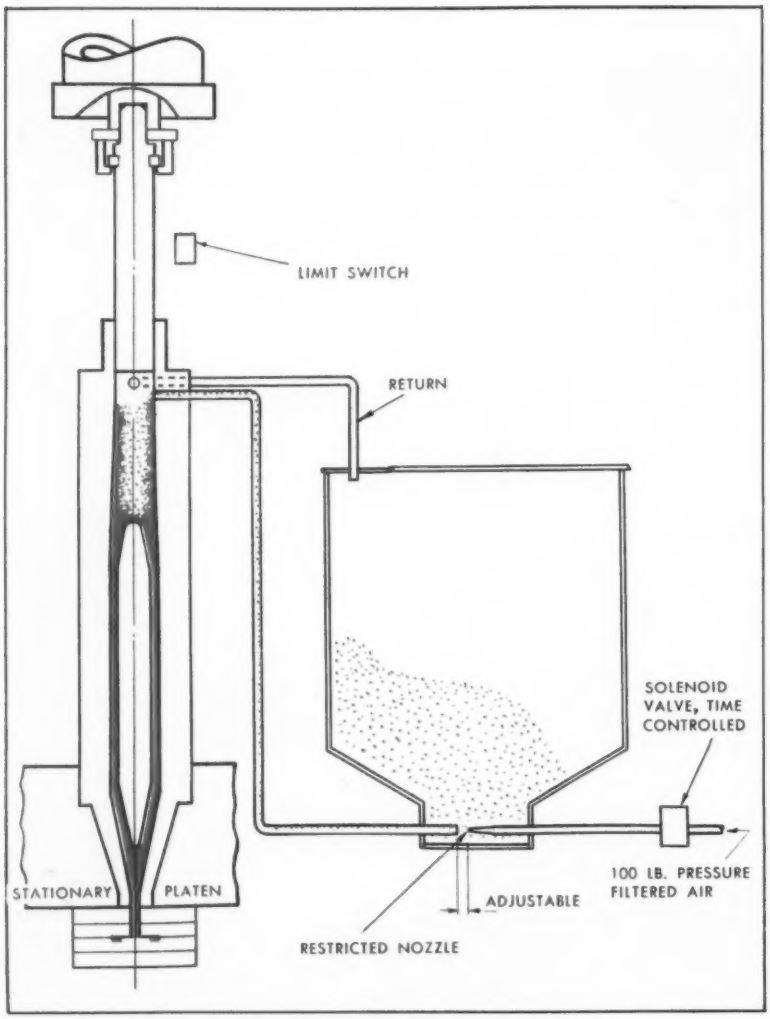

Fig. 2—New machine uses jet-loading. In cycle above, injection chamber is not completely filled; when filled, excess granular material feeds back to hopper via return pipe

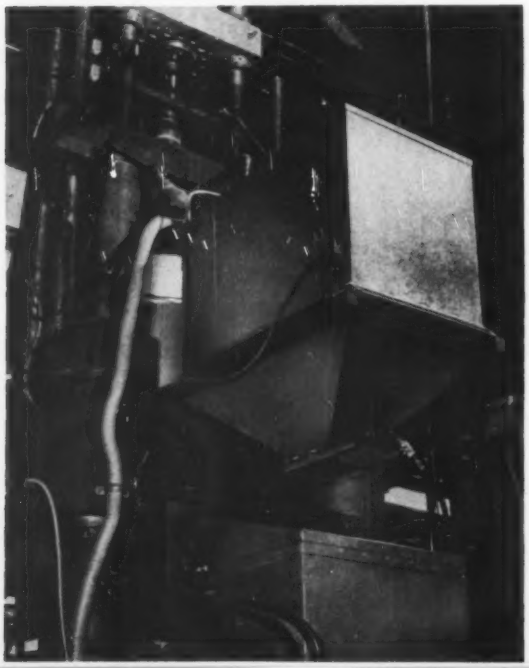

Fig. 3—Hopper for jet loading is in upper center, with unloading door at bottom of hopper. High-pressure air connection and part of loading pipe are visible at lower end of material hopper. Rectangular hopper below material hopper receives molded caps after ejection

with the exception of timers and solenoid actuated air valves, there are no moving parts to get out of order and cause trouble.

Jet Loading

As can be seen from the drawing, Fig. 2, the jet method of loading makes use of a closed system. Air at 100 p.s.i. pressure is fed to a restricted nozzle in the lower part of the material hopper. This nozzle is located directly opposite and close to a feed pipe of ¾ in. I.D.

This feed pipe leads to a port in the upper end of the injection chamber. Just above this entrance port is another opening in the chamber which is connected by a return pipe or vent to the top of the material hopper.

With the injection piston in the raised position, both these ports are open. As the air, timer-controlled, blasts out of the jet nozzle, it forces the granular material to flow through the loading pipe into the injection chamber. The timer can be set so that only a predetermined weight of material will be delivered to the chamber at each shot, if this type of operation is desired. On the other hand, the timer may be set so the injection chamber will be completely filled each time. Because of the use of the return pipe, no problem of air blocking occurs. Also, if the air jet continues to operate after the chamber is fully loaded, the excess granular material will return to the hopper through the vent pipe.

This method of injection chamber loading has many advantages. The air stream will not transport nuts, bolts or other comparatively heavy objects from the hopper to the cylinder. As every molder knows to his sorrow, such objects have sometimes become lodged in the injection cylinder, either blocking off the flow or causing considerable damage to the equipment.

Because of the relatively small inlet hole required in the cylinder, the cost and size of the feed sleeve is greatly reduced as compared with an equivalent rig for a gravity feed setup. And because the chamber can be loaded brim full, very often a decided advantage is gained when a "stuffing" cycle is included in the press sequence. It is also claimed that the jet loader is also useful when it is desired to run molds on the "starve-feed" technique. Here

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● *Fairway golf bag and Tommy Burns clubs produced by Sportsman's Golf Corporation, Chicago, Ill. Tenite Butyrate bag top and club ferrules molded by Keolyn Plastics, Inc., Chicago; bag bottom molded by American Plastic Corporation, Chicago.*

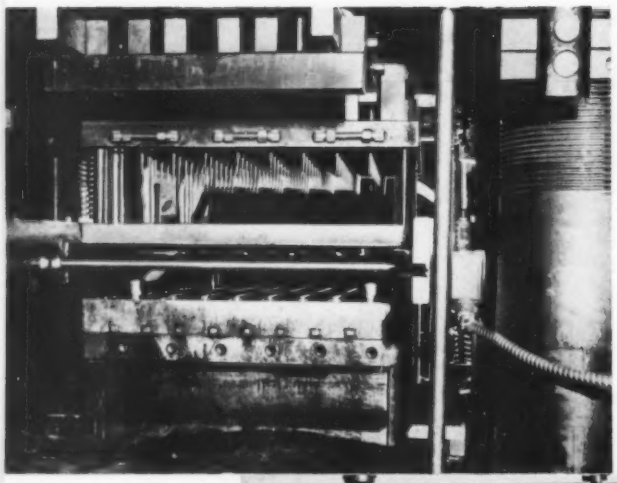


Fig. 4—Mold is partially open. Network of runners and sprues can be seen held suspended in runner plate. Gates have been broken and sprues pulled out of center of each force plug

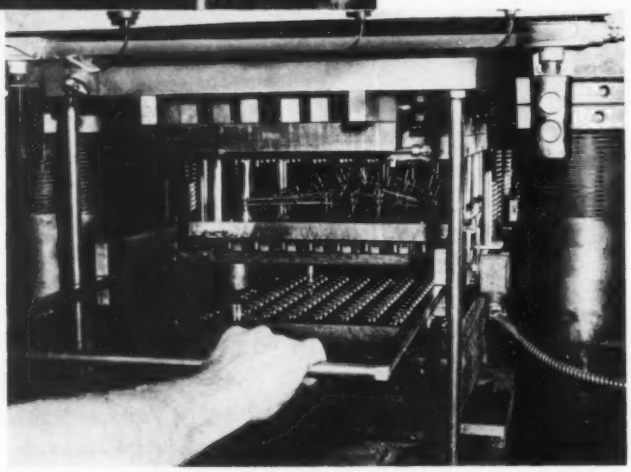
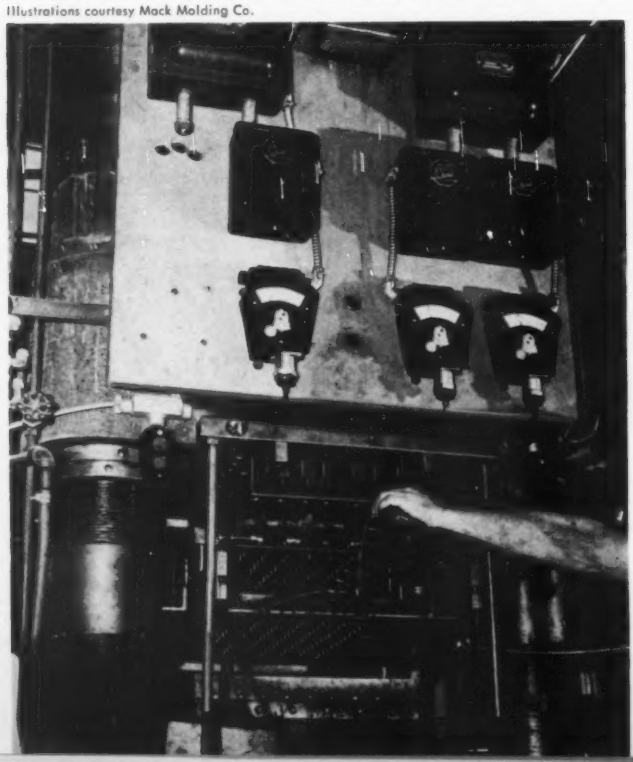


Fig. 5—Knock-outs have pushed sprues and runners out of runner plate. Unloading tray has been pulled forward and caps are resting on it. When tray is pushed back, caps are unloaded

Fig. 6—Operator manually removes network of sprues and runners from between force plate and bottom of sprue and runner plate for regrinding and reuse

Illustrations courtesy Mack Molding Co.



the control set-up consists of a timer - actuated solenoid - operated air valve which serves to deliver a uniform charge of powder each time and also enables the operator to easily adjust the amount of feed until the desired "starve" condition is attained. One difficulty in using this equipment on "starve feed" is that a close check must continually be made on the size of the powder granulation since a change in granulation size will alter the weight of the load. However, by a change in the timber setting, the operator can quickly compensate for such changes.

Color Change Simplified

Because the hoppers used in this system are mounted outboard of the press (Fig. 3), it is simplicity itself to empty the hoppers from the bottom trap door provided for that purpose. This feature greatly simplifies color change-over and also makes it feasible to build large-size hoppers which require only infrequent filling.

The particular injection machine used for illustrative purposes in this article was producing polyethylene closures for Colgate toothpaste tubes at the time the photos were taken. A 104-cavity automatic unscrewing mold had been particularly designed for a high production rate. The sequence of operations is illustrated in Figs. 4, 5, and 6.

One of the requirements for automatic unscrewing is the necessity of breaking the gate with the caps still in the mold. This required a three-plate mold design, the extra plate being an auxiliary runner plate.

The center plate holds the force plugs and the lower plate holds the cavities. As the mold starts to open the center and lower plates drop away from the upper plate, thereby breaking the pin-point gate from the center of the inside of the cap. Slight undercuts in the runner grooves and top of the sprues hold the runners and sprues in the upper plate as shown in Fig. 4. Thus, as the force plate continues to drop, the sprues are pulled out of the sprue holes which are through the center of each force plug.

Unloading the Mold

Hydraulic cylinders operating a system of racks and pinions turn the force plugs, thereby unscrewing them from the caps. This unscrewing

(*Continued on p.* 198)

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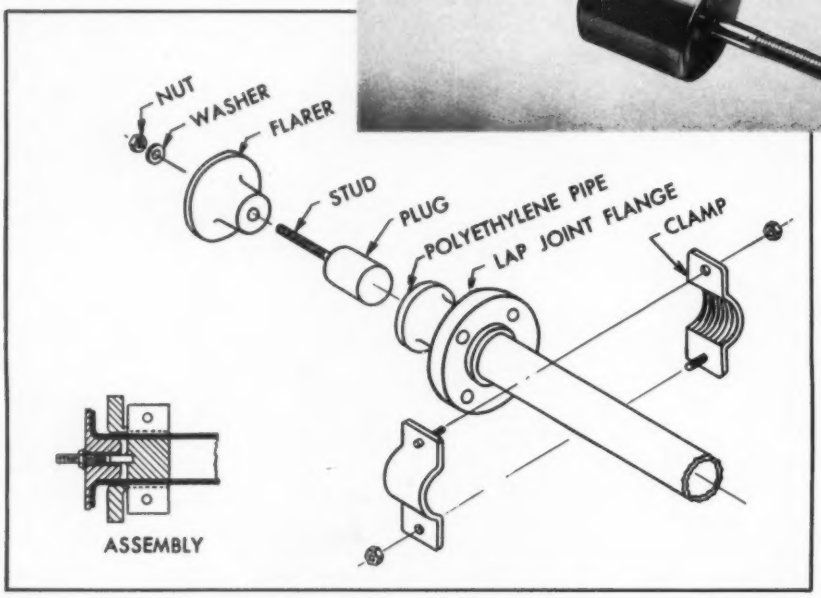
Main component parts of the tool especially designed for producing integral flanges on the ends of polyethylene pipe. One half of the holding clamp is shown in place on flanged pipe end in photo

Illustrations courtesy Du Pont



Relative positions of the tool parts prior to forming a flange; at lower left is a cutaway assembly view. During the flanging operation, the polyethylene pipe end is submerged in boiling water; the flarer is screwed into place far enough to form the flange; and the assembly is cooled

Polyethylene Pipe Flanging

by Flave Pledger* and D. J. Ryan*

A SIMPLE and effective method of forming integral lap joint flanges on polyethylene pipe has been developed by Du Pont engineers. Use of this method results in tight joints and simplifies connecting the plastic pipe to tanks and to the flanged ends of metallic pipe.

Polyethylene may be machined and welded much like metal. It has been common practice, therefore, to use threaded fittings and welded flanges for joints in polyethylene pipe. Because of its plastic properties, this pipe has also been joined to metallic materials by banding, a method used successfully with rubber hose. All of these types of joints are satisfactory for ordinary service.

At times, however, the above methods are impractical or inconvenient. In such cases, excellent connections may be made with lap joint (Van Stone) flanges. These are especially useful when joining polyethylene to tanks with flanged connections or to thin-wall stainless steel pipe which cannot be threaded.

To be used with lap joint flanges, polyethylene pipe must have an integral flange. Although polyethylene can be worked easily after immersion in boiling water, such flanges are difficult to form with conventional tools. A flaring tool, similar to those used for flaring copper tubing, has been developed which can form flanges on polyethylene pipe easily, quickly, and at low cost.

Operation of the flaring tool is simple. First, the plug with a threaded stud is inserted in the tube and clamped. The end of the pipe is then submerged in boiling water to soften the material. Next, the lap joint flange is slipped over the pipe and the flarer is placed on the stud and screwed into the pipe by means of a nut. Finally, the assembly is quenched in cold water and the tool removed.

It is advisable to make up the joint as soon as possible after forming the ends, since polyethylene tends to resume its former shape after a period of time. An outstanding feature of this type of joint is that the flared polyethylene forms a natural gasket when the joint is tightened.

Where exceptionally good joints are required for polyethylene pipe, lap joint flanges are the answer since they combine high mechanical strength with resistance to leakage.

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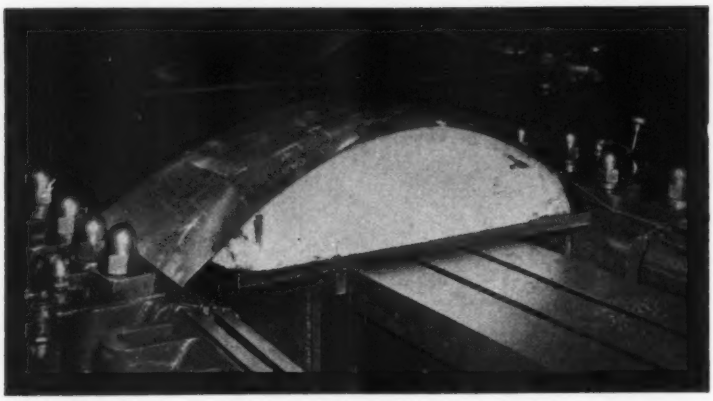
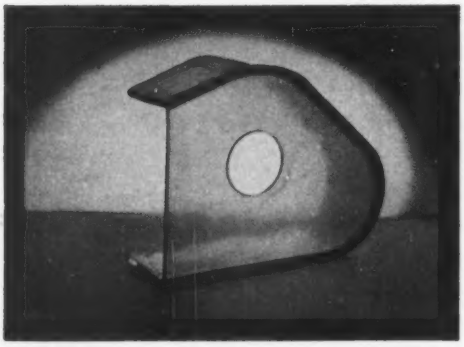


Cast stretch-die used in forming aluminum aircraft parts. The high compressive strength of Marblette's resin #71 makes it particularly adaptable to this operation.



Transparent gear housing cast from Marblette phenolic resin #88 demonstrates the excellent light transmitting properties of the Marblette compound.

The stylus of the pantograph is moved over the contours of the pattern, made of Marblette resin #71, reproducing it with complete accuracy in the multiple cavity steel die in the background.

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PLASTICS*
TECHNICAL SECTION: Dr. Gordon M. Kline, Technical Editor

Hardening Speed of Phenoplasts†

by H. L. Bender**

The hardening of phenolic resins by use of hexamethylenetetramine is considered from the viewpoint of the condensation reaction series, which reaction usually involves formaldehyde in some portion of the cycle. Novolac resins from phenol and formaldehyde, in the past, have been produced largely by the use of acid catalyst. Then the acid resins were hardened by use of hexa under heated conditions. All these older commercial novolac resins have hexa-hardening speeds which, under any one condition, were much alike as to rate. A resin with a new, and faster, hexa-hardening rate has been developed lately as a result of obtaining the complete series of pure two-ring dihydroxydiphenylmethanes. The hexa reaction speed of these showed wide differences in rate of change when heated. A chemical structural effect was found in that chain connectors ortho to the hydroxyl of the ring gave novolac resins with a more rapid hexa-hardening rate than did the para connectors.

The problem is to stop a reaction series while the resin is a liquid melt, then to finish the reaction process within a very short hardening time. The ideal would be to bring up a cold mass to a punch press, then to melt, shape, and finally heat-harden the material within a fraction of a second. This situation is a viscosity-time problem.

The hardening rates of known intermediate products in the phenolic resin field reacted with hexa are presented. A surprising reversal of ortho and para effects is found in one section of the data. The relative importance of the known structural variables in phenolic resins is compared to their hexa-hardening rates.

THE condensation of phenol and formaldehyde to make infusible resin involves a series of intermediate chemical reactions, each one of which has its own characteristic response to temperature, catalysts, and other reaction conditions. The final step of changing these resins from a fusible to an infusible form is a special technique of great value in the technology of phenolic resins. The production of small articles in expensive molds requires that this polymerization step be a rapid transformation from a melt to a solid at the hardening stage. The use of hexamethylenetetramine as a hardening agent represents a common method of achieving such a rapid rate in a heat-hardening cycle (1)[1]. Some ammonia gas is released during hardening.

In this investigation a hot plate hardening procedure (2) is used to determine the comparative hardening reaction rates. This method involves a well-stirred, melted resin heated at 160° C. until it hardens to an infusible thin slab. Then, as a check on the extent of hardening, this slab is given two additional tests. The hot resin slab is removed within 60 sec. after completion of the hot plate test and allowed to cool. To be considered as a heat-hardened resin, a portion of the cooled slab must not melt when dropped onto a hot surface maintained at 200 ±5° C. Similarly, it must not disintegrate when immersed for 1 hr. in acetone held at normal room temperature. Supplementary tests such as these eliminate resins which advanced somewhat in melting point but did not actually become infusible at a temperature of 160° C.

An understanding of the effects of specific chemical structures upon the hexa-hardening cycle necessarily involves a study of the total resin reaction cycle. This includes all the intermediate reactions of the cycle. Here the essential question is that of choice of the resin structure ready to be hardened with hexa. Since much is known concerning catalysts, solid filler surface, temperature effects, and other variables, these factors are held constant. Therefore, the question essentially reduces to the selection of a particular resin structure for the hexa-hardening reaction.

Acid-catalyzed novolac resins have been produced for many years. All of these were much alike both in their hardening properties and their chemical structure. A recent study of the essential chemical parts of such resins has given a new set of phenolic resins, some with faster, and some with slower polymerization rates than normal phenolic resins (3, 4).

The task of purifying novolac resins into exact chemical products, generally of a crystalline type, has been attempted, and some of these results published (5). Some of the hexa-hardening differences of these purified products have been published in patent form (6).

Short Chain Chemicals

There are some chemical surprises in the data for short chain compounds. Phenol, itself, reacts and then hardens with 15% by weight of hexa in 276 sec. under the test conditions. Under these conditions some free phenol is left in the hardened mass. However, orthocresol undergoes only partial reac-

* Reg. U. S. Pat. Off.
† Based on a talk at A.C.S. Polymer Div., Mar. 17, 1953, at Los Angeles, Calif.
** Bakelite Co., a Div. of Union Carbide and Carbon Corp.
[1] Numbers in parentheses link to references at end of article.

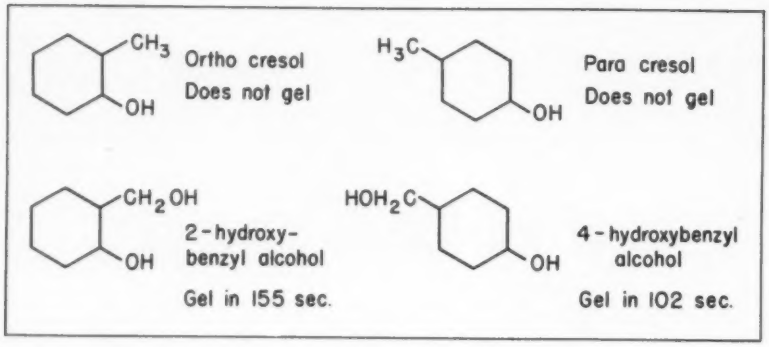

Fig. 1—Hexa-hardening speeds of single-ring compounds; 15% hexa at 160° C. (phenol gels in 276 seconds). Para substitution results in faster hexa-hardening product

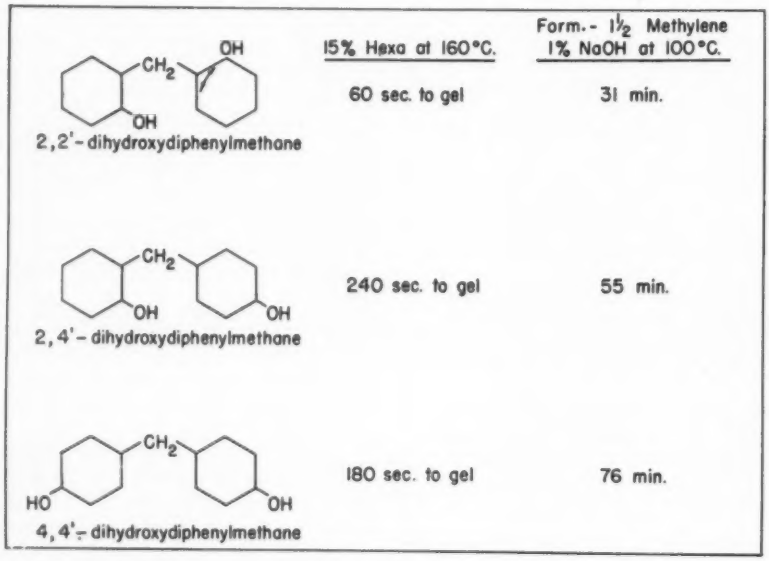

Fig. 2—Hexa-hardening speeds for two-ring compounds. Novolac resin chains grow in length by alternate reactions of phenol and formaldehyde

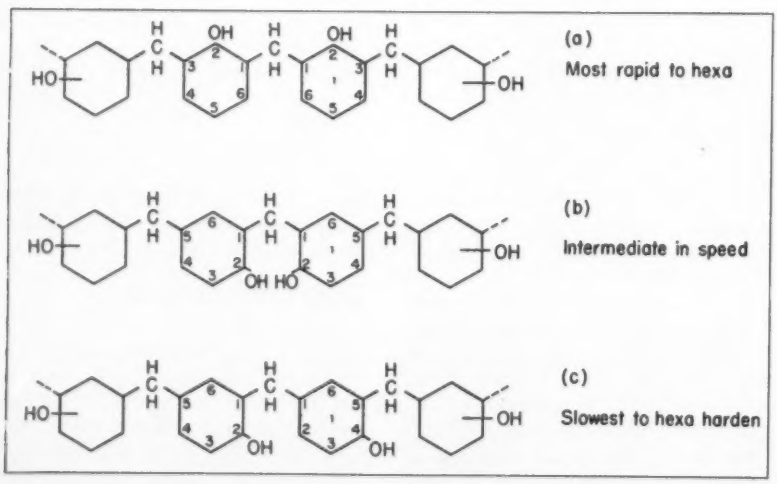

Fig. 3—Hydroxyl position effects in hexa-hardening speeds. In (a), hydroxyls are 2,2' with respect to central methylene group, methylenes on adjacent ring are 3 and 3'

tion, and the mass does not become infusible. This leads to a tentative statement that a substitution on a phenol is not desirable for hexa-hardening purposes. On the other hand, a hydroxymethyl substitution, either ortho or para, to the ring hydroxyl, gives substituted phenols which will harden with hexa faster than phenol itself. The para substitution here gives the more rapid hexa-hardening product, as shown in Fig. 1. In the case of greatest interest as to novolac resins the substituent is the di-reactive methylene group,—CH_2—.

The novolac resin chains grow in length by alternate reactions of phenol and formaldehyde. Thus, the first formation of diphenylols is reached in Fig. 2 by the addition of a second phenol to a hydroxymethylphenol (5, 7). At this reaction point, there are found three crystalline isomers (3) with methylene connectors. When these two-ring crystalline chemicals are examined by the method of hexa-hardening, the data of Fig. 2 show that the diortho isomer is more rapid than the dipara, and the dipara is more rapid than the ortho-para.

In other words, if one of the hydroxyls on the 4,4' dipara isomer (gel time, 180 sec.) is changed to the ortho position, the resulting 2,4' ortho-para isomer has a slower reaction rate (gel time, 240 seconds). If, however, the remaining para hydroxyl of the 2,4' isomer is transferred to the ortho position, the resulting 2,2' diortho isomer exhibits a greatly accelerated reaction rate (gel time, 60 seconds). Thus, the two-ring isomer series indicates that methylene substitution is desirable for increased hexa reaction speed, and that some form of diortho hydroxyl substitution is particularly advantageous.

Medium Size Resin Chains

For a resin chain long enough to minimize the end effects, consider the central methylene group as a start for the ring numbering system, as shown in Fig. 3. Chains (a) and (b) represent two possible types of diortho hydroxyl substitution. The fastest reacting, and therefore the preferred type, is the diortho effect illustrated by chain (a). Here, the hydroxyls are 2,2' with respect to the central methylene group; the

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Isomer	15% Hexa at 160°C.	Form.-1.5 Methylene at 100°C., 1% NaOH
2,6-bis(2-hydroxybenzyl) phenol M.P. 162°C.	20 sec.	12 min.
2,4-bis(2-hydroxybenzyl) phenol M.P. 123°C.	56 "	16 "
2-(2-hydroxybenzyl)-6-(4-hydroxybenzyl) phenol	56 "	18 "
2-(2-hydroxybenzyl)-4-(4-hydroxybenzyl) phenol	74 "	32 "
2-(4-hydroxybenzyl)-4-(2-hydroxybenzyl) phenol	135 "	49 "
2,6-bis(4-hydroxybenzyl) phenol M.P. 171°C.	138 "	50 "
2,4-bis(4-hydroxybenzyl) phenol M.P. 150°C.	160 "	60 "

Fig. 4—Hexa-hardening rates of several three-ring isomers

methylenes on each adjacent ring are in the 3 and 3′ positions; and the para or 5,5′ positions are open. The structure undergoes the most rapid reaction with hexa.

Chain (b) also illustrates the diortho hydroxyl configuration. In this case the hydroxyls are 2,2′ to the central methylenes; however, the 5,5′ para positions are occupied by methylene linkages, and the 3,3′ positions are open. This situation available for additional reaction is just the opposite of that in chain (a) and accounts for the slower reaction rate.

The structure shown in chain (c) represents the slowest hexa reacting configuration. The hydroxyls occupy the 2,4′ ring positions; the methylene groups on adjacent rings are on the 5,5′ para positions with the 3,3′ positions open.

Three-Ring Isomers

A study of the three-ring isomers as listed in Fig. 4 also shows a rapid hexa reaction rate for diortho configurations. As shown in Fig. 5, the center ring has two methylene connectors, and its hydroxyl may be ortho to either one or to both of these methylene groups. The ortho positions of the end ring are equivalent by a rotation mechanism. The fastest reacting three-ring isomer has both methylene groups ortho to all its hydroxyls and it reacts more rapidly with hexa than does the most rapid two-ring diphenylol. Comparisons of the two- and three-ring chemical chains of the same structure show that there is an increase of speed with the three-ring due either to greater chain size or due to this new triortho possibility. An increment in rate is found for increase in chain size, as shown in Fig. 6.

Structural Effects

Explanations are desirable for reversal effects which occur in going from one-ring to two-ring size. Also, explanations are needed for the differences found in hydroxyl structures that are situated on two neighboring rings in the phenol-formaldehyde resin series being considered here.

Two reasonable explanations are advanced for these measured differences in the hexa-hardening reaction rates. The first explanation concerns the possibility that in multiple ring compounds, open para positions on the ring are favorable to gains in hexa-hardening rate. The second explanation concerns the close proximity of ring hydroxyl groups to each other. This configuration will affect the reactivity of the ortho and para positions of the ring and, thus, affect the hexa-hardening rate. In Fig. 3 (a), these favorable effects are both present and result in a very high rate; in Fig. 3 (b), the close hydroxyl effect is present but there are no open para positions; and in Fig. 3 (c), neither effect is included in the chemical structure.

Three of the ortho and para isomers of dihydroxydiphenylmethane

Compound	Size	Sec. to Gel
2-hydroxybenzyl alcohol	1 Ring	155 sec.
2,2′-dihydroxydiphenylmethane	2 "	60 "
2,6′-bis(2-hydroxybenzyl) phenol	3 "	20 "
2,2′ resin (sharp fraction)	6 "	12 "

Fig. 6—Effect of chain size on hexa-hardening rate; 1.5 methylene per ring at a temperature of 160° C.

are found in the two-ring series of phenol-resin products shown in Fig. 2. Two of these isomers have been known in an impure crystalline form since the time of Dr. L. H. Baekeland's early work on phenol-formaldehyde resins. They were hard to purify and only recently have they been produced in a fully purified form. The data of 2,2′-dihydroxydiphenylmethane were not published until the last decade (6), and in recent years this 2,2′ structure has ben produced in volume because of the high hardening rate it possesses.

Figures 4 and 5 give the hexa-hardening data on seven three-ring isomers which vary in their speed by a factor of over five times.

Since the methylene connector and the phenylene ring are both common throughout the phenol-formaldehyde resin series, the two most important structural effects on hexa-hardening rate are the hydroxyl position on the ring and the

(*Continued on p. 200*)

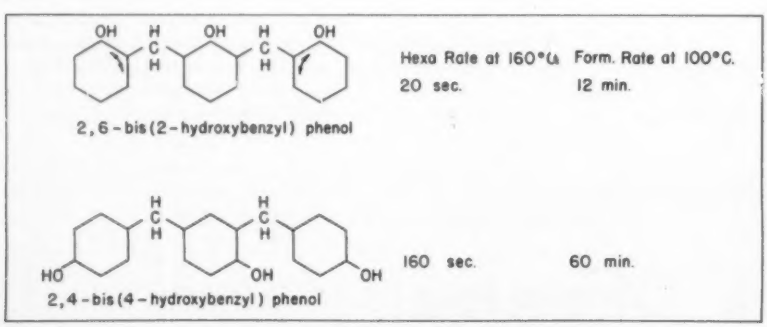

Fig. 5—Structure effects in hexa-hardening of three-ring isomers

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Dimensional Changes in Rigid Vinyls

by M. L. Dannis*

The use of rigid vinyl resins requires a knowledge of their thermal expansion characteristics and dimensional stability. A simple apparatus to measure differential coefficient of expansion is described. Shrinkage during the annealing or heat-treating process is also easily measured. Expansion coefficients of a given sample depend upon method of preparation as well as upon compounding. Values are in the range of 70 - 200 $\times$ 10^{-6}/°C.

THERMAL expansion and contraction are physical properties that are important in molding and fabricating and in fulfilling service requirements. Typical fabrication problems would include the computation of mold sizes to make plastic articles which fit closely; typical usage problems would include expansion joints in some piping applications. In many applications of rigid vinyl articles, the pieces will be used in combination with other materials, often metals. In such cases, the differential coefficient of expansion will limit the closeness of fit obtainable over a range of temperatures. A simple apparatus has been developed to measure the differential coefficient of expansion of rigid vinyl materials in relation to steel.

Apparatus and Methods

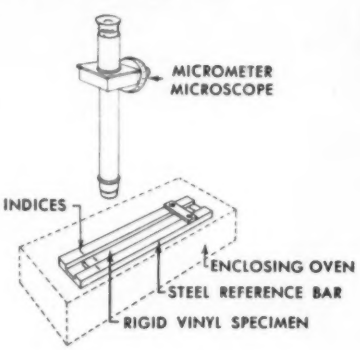
The apparatus used to measure differential expansion and contraction between rigid vinyls and steel is shown in Figs. 1 and 2. A micrometer microscope is used to observe the relative movement of a mark ruled with a drawing pen and india ink on the specimen against an index mark on the reference bar. The specimen is held in a groove in the reference bar by a clamp at one end. The groove is polished and lightly lubricated to prevent sticking of the specimen. The distance between the mark on the specimen and the reference mark can be read reliably to less than 0.0001 inch. The length from clamp to mark is about 5 in., making the ultimate accuracy 0.00002 in./inch. Specimens about 6 in. long and ⅜ in. wide were cut from sheets about $\frac{1}{32}$ in. thick.

Temperatures are measured with a thermocouple inserted into a hole drilled in the reference bar. A draft and radiation shield covers the bar and specimen. The bar rests on another steel block cemented in turn to a strip heater. The intermediate block smooths out most of the gradients present in the heater. The temperature is raised stepwise by increasing the voltage on the heater, then reducing it somewhat to establish equilibrium. Adequate equilibration is attained in 10 to 15 minutes.

The accuracy of measurement of temperature measurement was about ½° C. The intervals between equilibration temperatures were about 10° C. Measurements were carried up to about 130° C. The apparatus is not restricted to this limit.

Fig. 1—Photograph of differential thermal expansion apparatus, with draft shield removed to show specimen of rigid vinyl in place in reference bar

Fig. 2—Schematic drawing of equipment shown in photograph above



Test Results

Typical data are shown in Fig. 3 for a specimen cut from a press-polished sheet of Geon 8700. The specimen was observed through several cycles of heating and cooling.

The initial warming, AB, shows simple linear expansion of the plastic relative to the bar. Further warming, BC, shows contraction as some internal stresses frozen in during press polishing were released. Still further warming, CD, shows the effect of residual stress relief competing against thermal expansion. Some further relief is shown in the initial portion of the cooling curve, DE, but the behavior is linear otherwise. At E, a change of slope is shown. The remaining contraction EF, is linear. This curve. DEF, is repeatable in further cycles of heating and cooling, if the

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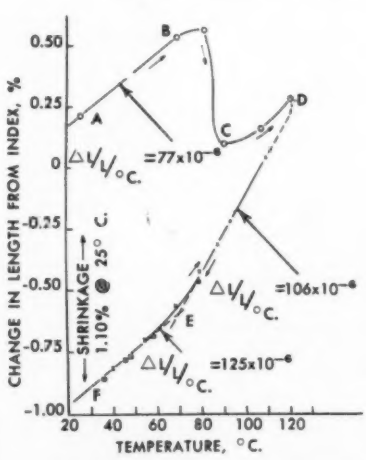
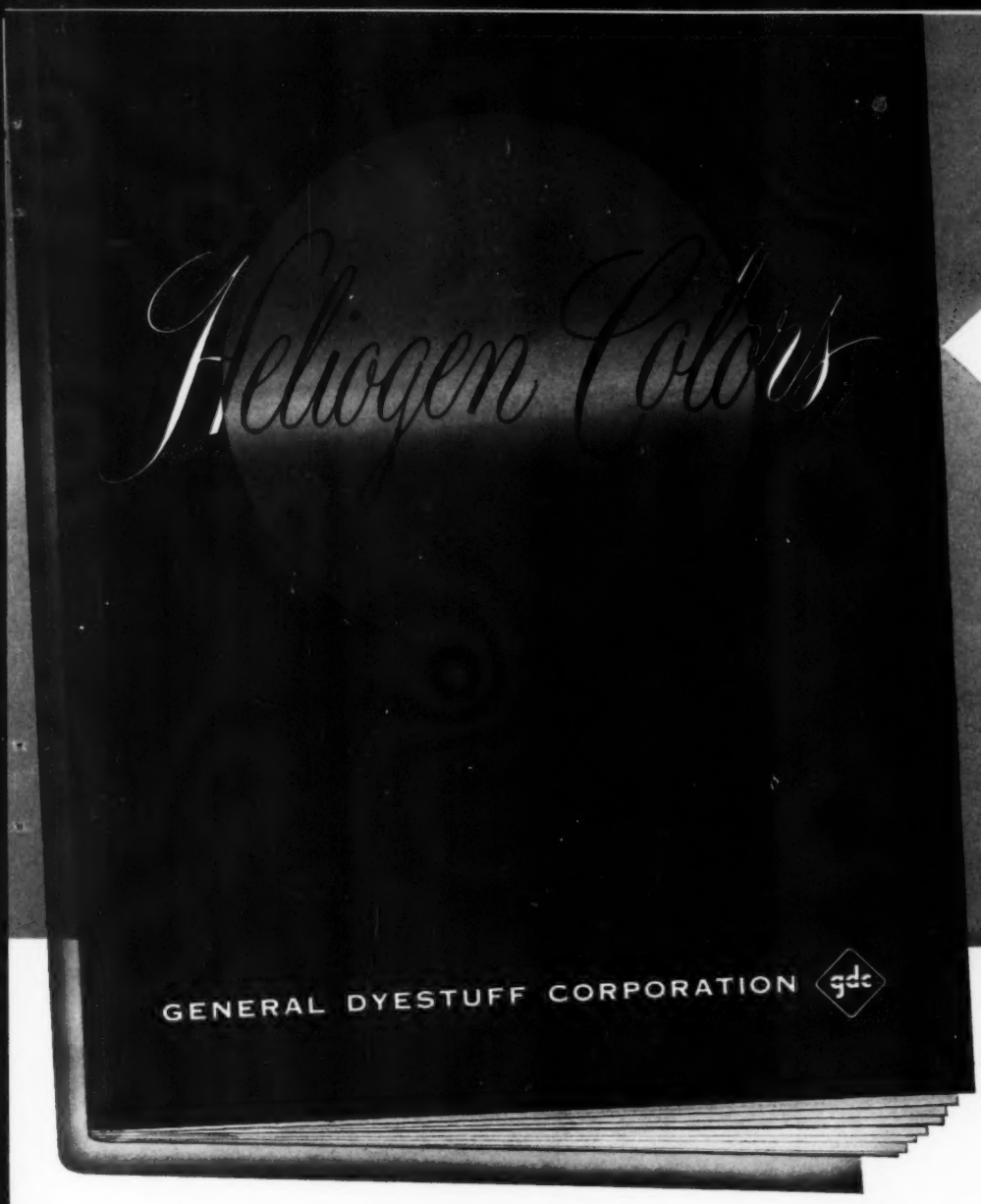


Fig. 3—Typical thermal-dimensional relationships of rigid vinyl resins

* B. F. Goodrich Research Center



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Epoxidation-Hydroxylation Reactions

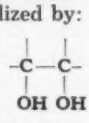
by Frank P. Greenspan*

EPOXIDATION and hydroxylation reactions with hydrogen peroxide and peracids are versatile new chemical unit operations, placing at the disposal of the organic chemist new building blocks for synthesis to be utilized along with the older unit operations of chlorination, hydrogenation, esterification, and the like.

What is epoxidation? Epoxidation, broadly speaking, is the reaction of an unsaturated compound with an oxidizing agent to give an epoxy or oxirane compound. Structurally, epoxy compounds are identified by a three-membered carbon-carbon-oxygen ring, symbolically represented by:

Air, oxygen, and hypochlorous acid have been commonly employed for this reaction and are the routes to the production of the largest tonnage epoxide produced today — ethylene oxide. Where hypochlorous acid is employed, it is to be noted that the resultant chlorohydrin must be dehydrochlorinated to give the desired epoxy compound. Epoxidation reactions with hydrogen peroxide, usually through the medium of a peracid, are of more recent vintage, and have been successfully adopted in the last few years to produce a host of large scale commercial chemicals. This reaction, by contrast with those of oxygen and hypochlorous acid, appears to be a general one for the epoxidation of compounds with isolated double bonds (1).[1]

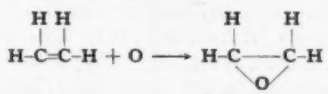
Hydroxylation of unsaturated compounds can similarly be carried out with hydrogen peroxide, again through the medium of a peracid, to give a polyhydroxy, or glycol derivative, symbolized by:



It is convenient to consider both reactions together because of the structural relationship of both compounds, the similarity in method of preparation, and the ease of transition from an epoxy compound to the corresponding glycol.

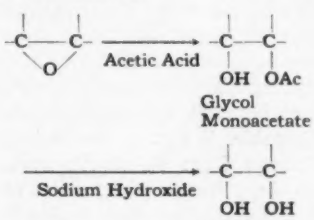
Reactions

The reaction of an unsaturated compound with hydrogen peroxide, usually in the form of an aliphatic peracid, is an addition reaction. Essentially, the active oxygen of the peracid may be considered as adding on to the double bond, the oxygen binding itself to both carbons involved in the double bond.



The resultant product is an epoxide.

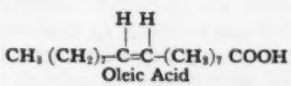
In hydroxylation reactions with a peracid, the same epoxide is formed as in epoxidation. However, in the former case, under the relatively severe reaction conditions employed, the epoxy ring initially formed is not stable and reacts with the aliphatic acid present, e. g. acetic, to form a glycol derivative, readily convertible to a glycol. We may picture this reaction as follows:



We have noted that hydrogen peroxide can react with unsaturated compounds to form epoxy and glycol derivatives. We should restrict this picture further to note that the unsaturated compounds must possess carbon to carbon double bonds. Now, this is not to say that all double bonds react alike. Actually, they do not. Some are very reactive, others quite sluggish and even non-reactive. The position of the double bond in the molecule and neighboring atoms and groups exert a major influence on the reactivity of the double bond (1).

Unsaturated compounds, then, are broadly the raw materials for epoxidation-hydroxylation reactions. Where do we find these raw materials? Fortunately, unsaturated compounds are widespread in nature and comparatively easy to synthesize.

Oils and fats of animal, vegetable, and marine origin are built in large part of unsaturated fatty acids. These may contain one, two, and even three double bonds per chain. The most widespread unsaturated fatty acid is oleic acid, structurally illustrated as follows:



Fatty chemicals thus constitute a major raw material for epoxidation-hydroxylation. Epoxy plasticizers are based upon this type of raw material.

Unsaturated hydrocarbons, olefins, result from various operations carried out in petroleum cracking and refining. Petroleum likewise provides cheap large tonnage raw materials for epoxidation-hydroxylation.

Terpenes are unsaturated hydrocarbons of special structure found in essential oils and in products of the naval stores industry. Thus, rosin, camphene, turpentine, etc., are terpenes. Tall oil is a mixture of rosin acids and unsaturated fatty acids. Natural rubber is related to the terpenes structurally and it, too, is a highly unsaturated compound. Terpenes contain reactive double bonds and are readily available low-cost raw materials for epoxidation-hydroxylation.

The organic chemist, fortunately, is not limited to molecules that nature places at his disposal. By various reaction techniques at his command, he can build double bonds into structures where none existed before. Thus, we find that a tremendously large number of unsaturated synthetic organic chemicals are available that will react with hydrogen peroxide and/or peracid.

Applications

We have explored the types of compounds that will undergo the epoxidation-hydroxylation reaction.

(*Continued on p. 202*)

* Buffalo Electro-Chemical Co., Inc., Division of Food Machinery and Chemical Co.

[1] Numbers in parentheses link to references at end of article.

PLASTICS DIGEST*

Abstracts from the world's literature of interest to those who make or use plastics or plastics products. Send requests for periodicals to the publishers listed.

General

MARKET PROSPECTS IN INDIA. Brit. Plastics *26*, 333-35, 350a (Sept. 1953). The development of the Indian plastics industry and current and future market prospects, with particular reference to the machinery field, are surveyed. Nearly all the Indian plastics firms are molders or fabricators so that the industry as a whole is almost entirely dependent upon imported raw materials. Annual requirements of molding materials are estimated to be about 4400 tons, of which about 1400 tons are thermosetting. At present, the Indian plastics industry is undergoing a recession following the post-war boom which reached its peak in 1951. It is estimated that the industry as a whole is working at only 60% of capacity on a single shift basis. There is, therefore, little market for plastics machinery at present. It seems likely, however, that future demand will be mainly for injection molding and extrusion machines.

Materials

DON'T UNDER-RATE NYLON FOR MECHANICAL COMPONENTS. J. Holt and W. Chadbourne. Product Eng. *24*, 203-11 (June 1953). Primary reasons for using nylon parts instead of metal parts are their low cost, inherent lubricity, excellent resistance to wear and abrasion, and excellent coefficient of friction. Success or failure of a nylon component is governed by basic soundness of the application, proper design, and good molding technique. Some of these points are discussed and examples of applications are given to explain why nylon has proved superior to metal in many applications.

ENGINEERING DESIGN FOR RUBBER-PHENOLICS. A. P. Landall. India Rubber World *128*, 776, 779-81 (Sept. 1953). The design concepts necessary for proper use of rubber-phenolic materials are discussed and these concepts are illustrated by describing applications and molding methods. In addition to general design and molding considerations, the specific applications are discussed so as to indicate the types of jobs which can be molded satisfactorily in rubber-phenolics, the economics of each job, and the advantages of these materials over those previously used for the applications.

CONTINUOUS PRODUCTION OF RESIN-BONDED WOODBOARD. Brit. Plastics *26*, 290-94, 308 (Aug. 1953); Plastics (London) *18*, 247 (July 1953). Mass production of woodboard is now being carried out by a continuous process involving the use of wood waste bonded with thermosetting resin. The resin mixtures used are based on urea-formaldehyde. The process and the continuous press are described in detail. The differences between the board so produced and conventional products are: 1) It has only one fixed dimension, the maximum width of 4 ft., which is governed by the width of the press. Because it is made by a continuous process it can be supplied in any required length and because the distance between the press platens is adjustable, it can be made in any thickness from $\frac{3}{16}$ to $\frac{3}{4}$ inch. 2) It is cheap because the process reaps all the economies that derive from continuous and automatic production. 3) It has the advantage over comparable products in that the finished material is uniform in quality due to the automatic continuous process and the elimination of the human element in manufacture. Possible applications include partitions, decorative panels and ceiling boards in offices, factories and ships, and varied uses in the furniture industry.

RESINS FROM SULFITED TANNINS AS ADHESIVES FOR WOOD. L. K. Dalton. Australian J. Appl. Sci. *4*, 136-45 (Mar. 1953). Tannin solutions after heating with sulfites have low viscosities and are suitable for the preparation of adhesives to be spread by mechanical rolls. The conditions for treatment with sulfite were determined for extracts from Eucalyptus crebra F.v.M. and Pinus radiata D. Don and for commercial mimosa extract. The sulfited tannin solutions, mixed with paraformaldehyde and a filler, were examined as adhesives for plywood. Strong, water-resistant bonds were obtained with all three adhesives.

EXPANDED AND FOAMED MATERIALS. A. E. Lever. Plastics (London) *18*, 274–77 (Aug. 1953). The author reviews the published information on expanded and foamed materials. Ten methods for producing foamed materials are listed. Properties listed to be considered in selecting a cellular material for a particular purpose are: thermal conductivity, water absorption, density-strength ratio, resilience, sound conductivity, electrical, fungus, and vermin resistance, flammability, fabrication, stability, and compressive and impact strengths. Properties of various foam materials and methods of preparation are discussed. The materials covered include chlorinated rubber, polystyrene, phenol-formaldehyde, polyvinyl chloride, cellulose acetate, and polyurethane. A comprehensive list of references is included.

VINYL PLASTICS SPONGES—THEIR PROPERTIES AND USES. K. Rose. Materials and Methods *37*, 104-105 (June 1953). Vinyl sponges can be made either open cell or closed cell by controlling the process variables. The open cell sponge has interconnecting cells similar to a natural sponge. The closed cell sponge has a pocket of gas trapped into each cell. Closed cell sponges are very useful in items requiring buoyancy. Densities of 12 to 18 lb./cu. ft. are easily obtained.

Molding and Fabricating

"MOLD-CLAMPING FORCES" IN MECHANICAL CLAMPING ENDS OF INJECTION MOLDING MACHINES. H. Beck and W. Landmann. Kunststoffe *43*, 403-09 (Oct. 1953). When flash-free and dimensionally stable moldings are expected from injection machines, it is imperative that the forces on the clamping end of the mold be sufficient to keep the latter securely closed. The magnitude of the forces developed by the clamp-

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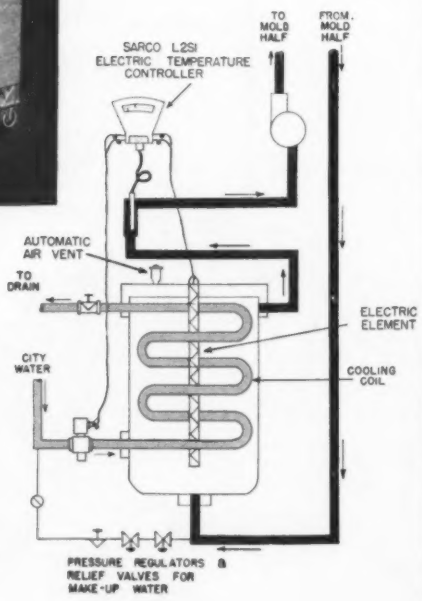

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ing end, called "mold-clamping forces" is not completely known for mechanically driven clamping ends of injection molding machines. Equations are given for the calculation of these forces for toggle-driven clamping ends most frequently found in injection molding equipment. Good correlation was established between these equations and results based on tests carried out with a hand-operated toggle drive.

INDUCTIVE TEMPERATURE CORRECTION FOR CALENDERS USED IN THE PLASTICS INDUSTRY. G. Ardichvili. Kunststoffe *43*, 441-42, 444 (Oct. 1953). The pivots of the calender rolls used in the plastics industry carry off some heat from the ends of the rolls and decrease the extent to which the rolls can be used as well as their economic value. A comparatively simple device is described which can be built in or attached later to the calender rolls and which gives even temperature distribution over the whole length of the calender, making the rolls 100% efficient.

Applications

PROPERTIES, PROCESSING, AND USES OF METAL-BONDING ADHESIVES. O. W. Loudenslager. Rubber Age *73*, 641-47 (Aug. 1953). The author discusses adhesives suitable for structural application; such adhesives are usually of the thermosetting type. The fatigue strength produced by using such adhesives is usually better than that of other joining methods, such as riveting or spot welding, but the peel strength is less. Most of these adhesives are highly resistant to chemicals and weathering. The essential elements in all adhesive bonding of metals are cleaning of the surfaces, application of the adhesive, and curing of the bond by means of heat and pressure. Problems encountered in these processing steps are discussed. High-strength metal adhesives have been used in the aircraft industry to attach stiffeners and ribs and to replace rivets, in the automotive industry to bond brake-linings and clutch-facings, and in sandwich materials. The processing, properties, testing, and uses of sandwich materials are discussed.

PROGRESS ON NAVAL USE OF REINFORCED PLASTIC PIPING. A. M. McKenzie and H. J. Stark. J. Am. Soc.

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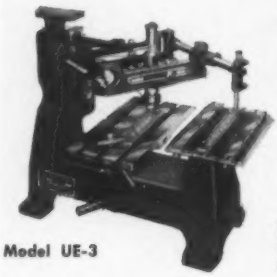

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Naval Eng. *65*, 57-70 (Feb. 1953). The information accumulated up to April 1952 on naval development and use of reinforced plastic piping is summarized. Preliminary work completed in 1949 resulted in the development of methods for fabricating glass fiber reinforced polyester plastic piping and established its properties. Its advantages include complete corrosion-erosion resistance and the highest bursting strength-weight ratio of known piping materials. Following this work, large scale corrosion-erosion tests were conducted by pumping sea water through a pipe system for 18 months. Adhesive bonded joints were also tested and were found to be satisfactory. Large scale fire tests showed the plastic piping to be resistant to destruction by fire while water is flowing through the system but it becomes unusable under heat conditions which do not seriously affect copper-nickel piping. Glass fabric polyester pipe was installed in a destroyer and appeared to be satisfactory after 8 months of service. It is now being installed in a minesweeper for additional testing for use with sea water, and hot and cold fresh water, up to temperatures of 180° F.

BATTERY SEPARATORS USE PHENOLIC RESIN. Brit. Plastics *26*, 366-68 (Oct. 1953). A description is given of the process for producing microporous separators for storage batteries, based on a glass-fiber kraft sheet impregnated with a water-soluble thermosetting resin to protect it from acid attack. The new separator gives a service life of up to 50% more than wood separators and gives the battery unrestricted storage life. The glass-fiber kraft sheet material is impregnated by feeding through a tank of dilute liquid phenol-formaldehyde resin. The sheet is then crimped, cured, and cut into separators.

VIETUM. Plastics (London) *18*, 297-98 (Sept. 1953). A new process is described for producing sleevings and coverings on metal and other rods and tubes by shrinkage of extruded polyvinyl chloride. This method utilizes an extruded tubular form of polyvinyl chloride which shrinks on heating to 130° C., without loss of desirable properties. The tube then fits so tightly around the covered object that it cannot be removed without cutting. A hard or a soft covering can be used. The diameter of the vinyl plastic tubing can be from 10 to 50% greater than the diameter of the object to be covered, making it possible to use this process for irregularly shaped objects. Possible applications include sports equipment, piping, and handles of all sorts including tool handles.

Coatings

CHEMISTRY OF WASH PRIMERS. H. Rosenbloom. Ind. Eng. Chem. *45*, 2561-68 (Nov. 1953). The reactions that occur between wash primer constituents are described. Oxidation plays a dominant part. Chromate derived from the pigment is soluble in the alcoholic phosphoric acid solvent and is the source of the oxidizing power of the composition. Phosphoric acid reacts with polyvinyl butyral but only under the influence of the reduction of chromium. The mechanism of this reaction was further clarified by studying the oxidation of alcohol solutions of polyvinyl butyral by mixtures of chromic and phosphoric acids. In these systems, a chromic

phosphate complex is formed. Data indicate that it is attached to the polyvinyl butyral chain and may function as a cross-linker between chains or may form polymers with similar groups along the chain. Phosphoric acid in excess of that required to form the complex inhibits cross linking or polymerization of the complex or both. Changes in the potential of electrodes immersed in wash primer compositions were used to follow the course of inorganic film formation. The adhesive properties of the wash primers are attributed partly to the existence of this film. Since adhesion is a function of phosphoric acid concentration, it is also probably a function of the degree of reaction between phosphoric acid (or the chromic phosphate complex) and polyvinyl butyral.

Properties

EVOLUTION OF HALIDES FROM HALOGENATED PLASTICS EXPOSED TO GAMMA RADIATION. J. Byrne, T. W. Costrikyan, C. B. Hanford, D. L. Johnson, and W. L. Mann. Ind. Eng. Chem. *45*, 2549-52 (Nov. 1953). When polymonochlorotrifluoroethylene (Fluorothene) and polyvinyl chloride are exposed to gamma radiation, the quantities of halogen evolved may be significant from corrosion and contamination viewpoints. For engineering purposes, the rate of evolution can be taken as 7 millimoles of halide per gram of material per billion roentgens of exposure. Polyvinyl chloride retained physical strength better than polymonochlorotrifluoroethylene during exposure to gamma radiation.

SOLUBILITY OF HIGH POLYMERS. O. Fuchs. Kunststoffe *43*, 409-15 (Oct. 1953). Our knowledge of the solubility of high polymers is mainly empirical and no systematic evaluation of the data from the standpoint of high polymer-solvent interaction has been made. The empirical method is very time consuming. In scientific as well as technical work it often becomes necessary to find new solvents for a known high polymer or new solvents for new polymers. It is therefore of great interest to get a clear picture of the solvent mechanism to eliminate unnecessary experiments. The basic difference between the solubility of low molecular and high molecular

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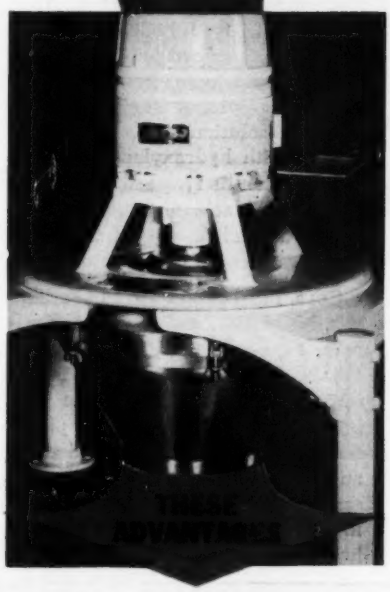

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polymers is explained. Many examples are given to show that the solubility behavior of high polymers can be explained quantitatively on the basis of intermolecular forces, such as dispersion, dipole moment, induction forces, and hydrogen bridges. The fact that a mixture of two nonsolvents often becomes a solvent is explained on this basis. Examples are also given for the opposite, where a polymer is insoluble in a mixture of two substances whereas each component alone acts as a solvent for the same polymer. Quantitative determinations cannot be made on the basis of intermolecular forces alone; they must include thermodynamic considerations, such as energy and entropy.

Testing

TESTING FILM BAGS FOR LEAKS. K. H. Hu and A. I. Nelson. Modern Packaging *26*, 124-25, 177 (Aug. 1953). A method is described for determining leaks in packages made from plastic film and tubing by placing the bag or tubing under water with known air pressure inside. The emergence of air bubbles from the package is a demonstration of porosity and the pressure under which the leak starts can be accurately measured. Results are reported for tests conducted on bags made of polyethylene, saran, and cellophane.

A NOTE ON THE RAPID DETERMINATION OF FREE FORMALDEHYDE IN PHENOL-FORMALDEHYDE SYRUPS. J. Haslam and W. W. Soppet. J. Appl. Chem. *3*, 328-9 (July 1953). A rapid method is described for determining free formaldehyde in phenol-formaldehyde syrups. The neutralized alcoholic solution of the sample is treated with hydroxylamine hydrochloride solution and the liberated hydrochloric acid then titrated with standard alkali to pH 3.4 by means of a direct-reading pH meter.

COLD BRITTLENESS OF POLYETHYLENE. M. M. Renfrew and A. J. Freeman. Modern Packaging *26*, 121-23, 173-74 (Aug. 1953). A test is described for determining the cold brittleness characteristics of plastic films. A steel ball is released down an inclined runway and pierces a sample of the plastic film held taut in a clamp similar to an embroidery hoop. The test is made in a cold box and the temperature at which the tear caused by the ball piercing the film changes from a straight-lined, stretching tear characteristic of a tough distensible material to the random shattering typical of a brittle material is called the "cold brittleness temperature." This marked change in type of break occurs over a 1 to 2 degree temperature range. Within wide limits, the velocity and size of the piercing ball do not affect the test results, and the thickness of the film is not a factor in the range of 0.001 to 0.005 inch. The effects of other variables in the test method are discussed. Results of tests conducted on polyethylene film are presented and interpreted.

DETERMINATION OF POLYSTYRENE IN STYRENATED ALKYD AND STYRENATED EPOXY RESINS. M. H. Swann. Analytical Chem. *25*, 1735-37 (Nov. 1953). A quantitative method for determining polystyrene in quick-drying styrene-modified alkyd resins is described. The styrenated epoxy resins were also investigated because of their related modification. Two procedures for determining the polystyrene were developed. One is

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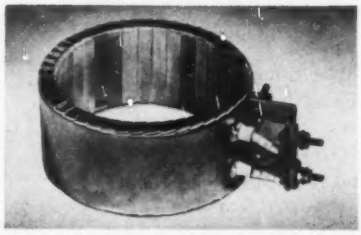

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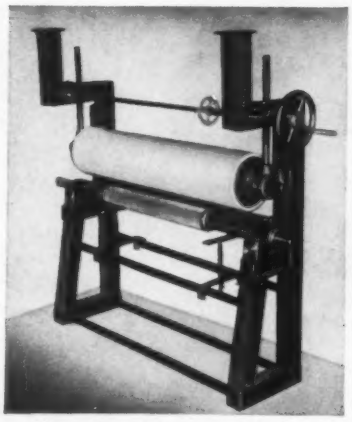

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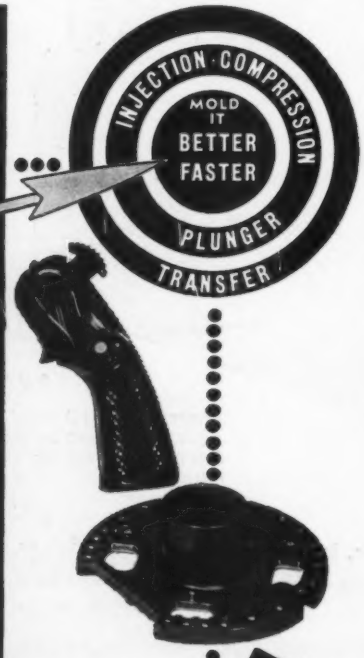

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applicable to either the alkyd or epoxy resins. The other, applicable to alkyds only, allows the subsequent determination of the oil acid content of the alkyd resin. Composition requirements of styrenated alkyds can be established and analytical control exercised. The extent to which monomer styrene is converted to polystyrene in the preparation of styrenated resins and oils can be determined.

SIMPLE FLEXIBILITY TEST. D. G. Stechert. Analytical Chem. *25*, 1730-3 (Nov. 1953). Equipment, technique, and calculation for the determination of flexural rigidity are described. An important advantage of this test is that products may be bent to a degree encountered in service. The test is sensitive to small variations in flexibility. It may be of value in engineering design and development work, and its simplicity would suit it particularly well for control work. Continuous lengths of hose or belting can be tested without being cut. Tests may be conducted at extreme temperatures, using an insulated box.

Chemistry

PROPOSED NOMENCLATURE IN THE FIELD OF MACROMOLECULES. H. Staudinger. Makromolekulare Chemie *9*, 221-240 (1953). The proposals of the Commission for Macromolecules of the International Union of Pure and Applied Chemistry are discussed. Early efforts to establish uniform nomenclature for macromolecular chemistry are also described. The differentiation between molecules and macromolecules; the definition of polymeric compounds as distinguished from polymerization products; the classification of macromolecular substances; and finally the differentiation between low-molecular and macromolecular materials are presented. A short discussion of colloidal solutions and of macromolecules in the solid state is given.

A NEW APPARATUS FOR RATE STUDIES APPLIED TO THE PHOTOPOLYMERIZATION OF METHYL METHACRYLATE. M. A. Naylor and F. W. Billmeyer, Jr. J. Am. Chem. Soc. *75*, 2181-5 (May 5, 1953). An apparatus is described which permits a reasonably accurate study of the rate of reaction by following the refractive index changes. Certain results obtained on the polymerization of methyl methacrylate are given.

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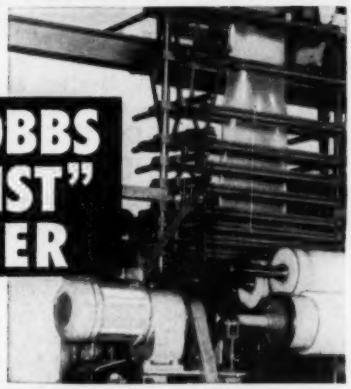

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U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

COPOLYMERS. W. A. Denison and W. N. Stoops (to Carbide and Carbon). U.S. 2,657,188, Oct. 27. Olefin-vinyl acetate copolymers.

ADHESIVES. P. S. Pinkney (to Du Pont). U.S. 2,657,189, Oct. 27. Hot-melt bookbinding adhesives.

COPOLYMER BLENDS. F. W. Banes, A. M. Gessler, and W. F. Fischer (to Standard Oil). U.S. 2,657,190, Oct. 27. Blends of polybutadiene and butadiene-acrylonitrile copolymer.

POLYMERIZATION. H. W. Coover and J. B. Dickey (to Eastman Kodak). U.S. 2,657,191, Oct. 27. Polymerization of acrylonitrile in the presence of preformed interpolymers.

ACROLEIN. H. C. Miller and H. S. Rothrock (to Du Pont). U.S. 2,657,192, Oct. 27. Polymerization of acrolein.

CONDENSATES. H. S. Bloch and H. E. Mammen (to Universal Oil). U.S. 2,657,193, Oct. 27. Condensates of an aldehyde or ketone with chromans, coumaran, or benzodihydrothiafuran.

POLYESTERS. J. C. Butler and D. C. McGowan (to Calif. Research). U.S. 2,657,194-5, Oct. 27. Linear polyesters from stilbene dicarboxylic acids.

POLYMERS. J. W. Fisher, H. Bates, and E. W. Wheatley (to British Celanese). U.S. 2,357,196, Oct. 27. Polyaminotriazoles.

COPOLYMERS. E. J. Carlson (to B. F. Goodrich). U.S. 2,657,197, Oct. 27. Copolymers of vinylidene cyanide with unsaturated aliphatic carboxylic esters.

POLYMERIZATION. F. O. Davis (to Reconstruction Finance). U.S. 2,657,198, Oct. 27. Polymerization of disulfide ring compounds.

INTERPOLYMERS. V. L. Folt and E. J. Carlson (to B. F. Goodrich). U.S. 2,657,199, Oct. 27. Interpolymers of a difluorodichloroethylene, 1,3-butadiene, and vinylidene chloride.

COPOLYMERS. F. C. McGrew and P. S. Pinkney (to Du Pont). U.S. 2,657,200, Oct. 27. Copolymers of acetylene with vinylidene compounds.

HYDROLYSIS. R. W. Nebel (to Du Pont). U.S. 2,657,201, Oct. 27. Controlled hydrolysis of polymeric esters.

GLOVE. C. L. Milton, Jr., and C. A. Nielson (to U.S.). U.S. 2,657,394, Nov. 3. Plasticized polyvinyl chloride cosmetic glove.

PLASTIC FORMING. C. E. Slaughter (to Extruded Plastics). U.S. 2,657,431, Nov. 3. Forming expanded plastic materials.

COPOLYMER. R. B. Woodward. U.S. 2,657,972, Nov. 3. Copolymer of l-leucine and dl-phenylalanine.

PAPER TREATMENT. R. H. Walsh and W. W. Pockman (to Du Pont). U.S. 2,657,991, Nov. 3. Incorporating polychloroprene in paper.

ION EXCHANGE. C. E. Johnson (to National Aluminate). U.S. 2,658,042, Nov. 3. Reaction product of formaldehyde and the reaction product of a chloromethylated polynuclear hydrocarbon.

GELS. C. E. Schildknecht (to General Aniline). U.S. 2,658,045, Nov. 3. Polyvinylpyrrolidone gels.

VINYL CHLORIDE. J. Dazzi (to Monsanto). U.S. 2,658,047, Nov. 3. Vinyl chloride polymers plasticized with cyanoethyl ethers of S-(2-arylethyl)-2-mercaptoethanols.

PLASTICS. R. J. Signer (to Visking). U.S. 2,658,048-50-1-2-3, Nov. 3. Hot melt vinyl resin nitrile rubber compositions.

RESINS. G. A. Coleman, R. B. Greene, J. H. Merriam, S. P. Miller, and R. F. Shannon (to Allied Chemical). U.S. 2,658,054, Nov. 3. Continuous process for production of phenol-type resins.

POLYMERS. T. Alderson (to Du Pont). U.S. 2,658,055, Nov. 3. Condensates of hydroxypivalic acid.

POLYMERS. G. E. Ham to Monsanto). U.S. 2,658,056, Nov. 3. Polymeric N-methacrylyl morpholine.

POLYMERIZATION. H. F. Park (to Monsanto). U.S. 2,658,057, Nov. 3. Polymerization with a mixture of 4,4-dihydroxy benzoyl peroxide and adipoyl peroxide.

POLYMERS. T. E. Werkema (to Dow). U.S. 2,658,058, Nov. 3. High polymers of alpha-methyl styrene.

POLYMERIZATION. E. F. Peters and B. L. Evering (to Standard Oil). U.S. 2,658,059, Nov. 3. Polymerization of ethylene in the vapor phase.

MOLDING. C. H. Cuppett and J. Taylor (to Hydraulic Molds). U.S. 2,658,237, Nov. 10. Injection molding machine.

FASTENER. L. W. Koutnik (to F. S. Brainard, Jr.). U.S. 2,658,250, Nov. 10. Extruded slide fastener.

RESINS. D. K. Pattiloch (to Chemloch). U.S. 2,658,828, Nov. 10. Combining resins with cellulose.

LAMINATES. J. C. Perry (to Agrashell). U.S. 2,658,840, Nov. 10. Manufacture of wood laminates.

RESIN. B. W. Lew (to Atlas). U.S. 2,658,849. Nov. 10. Binder for glass fibers.

COPOLYMERS. W. C. Hollyday, Jr. and M. H. Mahan (to Standard Oil). U.S. 2,658,872, Nov. 10. Alkylating olefin copolymers.

COPOLYMER. R. R. Dreisbach and G. B. Sterling (to Dow). U.S. 2,658,877, Nov. 10. Self-extinguishing alkylbenzene copolymer.

BOARD. J. N. Sears (to L. J. Carr). U.S. 2,658,878, Nov. 10. Board from wood waste, soya flour, and melamine resin.

ACRYLONITRILE. R. G. Beaman (to Du Pont). U.S. 2,658,879, Nov. 10. Acrylonitrile polymers dissolved in nitromethane-water.

COATING. R. Landau (to Chempatents). U.S. 2,658,880, Nov. 10. Chlorinated polyethylene coating for fabrics.

MOLDING COMPOSITION. A. Hirsch (to Diamond Alkali). U.S. 2,658,881, Nov. 10. Molding composition of asbestos and a cohydrolyzate of phenyl silicon trihalide and ethyl silicon trihalide.

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LINDOL* tricresyl phosphate coal tar base	Technical	Clear transparent liquid	75	1.165 ± .005	0.01 (2)	99	30	1.553
CELLUFLEX* 179C tricresyl phosphate petroleum base	Technical	Clear transparent liquid	150	1.165 ± .005	0.01 (2)	99	30	1.553
CELLUFLEX* DBP dibutyl phthalate	Technical	Clear transparent liquid	50	1.045 ± .001	0.01 (2)	98	—	1.490
CELLUFLEX* TPP triphenyl phosphate	Technical	White flakes	20(4)	1.202 ± .005(1)	0.003 (3)	99	30	1.550 (1)
CELLUFLEX* [illegible] a mixed ester	Technical	Clear liquid	[illegible]	[illegible] ± .005	0.01 (2)	66	30	1.560
CELLUFLEX* DOP dioctyl phthalate	Technical	Clear transparent liquid	50	0.986 ± .002	0.01 (2)	98	—	1.485

(1) @ 60° C. (2) % as phthalic, max. (3) % as phosphoric, max. (4) molten.

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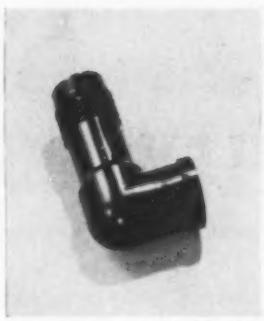

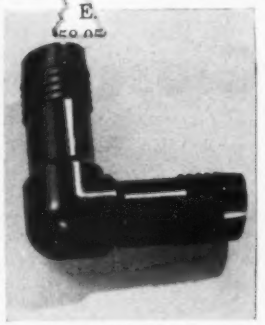

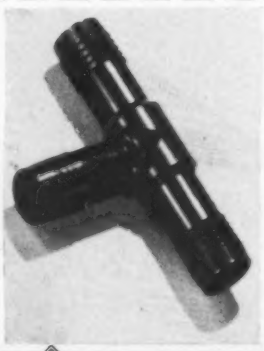

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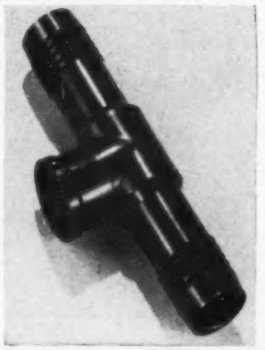

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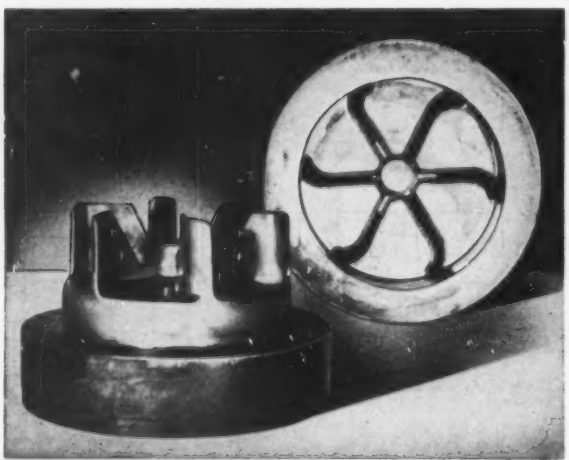

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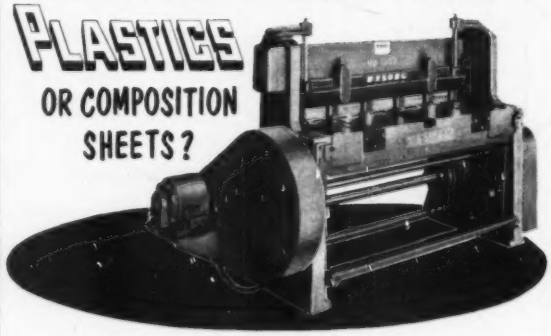

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Smook (to Du Pont). U.S. 2,658,-883, Nov. 10. Phenyl glycidyl etber as stabilizer for chlorosulfonated polymers.

POLYMERS. G. F. D'Alelio (to Koppers). U.S. 2,658,884-5, Nov. 10. Polymers from a chlorophenol, an aldehyde, and a chloroepoxyalkane.

POLYURETHANES. J. Swerdloff and S. B. McFarlane (to Celanese). U.S. 2,658,886, Nov. 10. Continuous production of polyurethanes.

POLYMERS. G. C. Johnson (to Socony Vacuum). U.S. 2,658,902, Nov. 10. Polymers of thiophene.

TEMPERING. P. Halbig and C. Taddei. U.S. 2,659,105, Nov. 17. Tempering curved plastic sheet.

HOLLOW SHAPES. G. W. DeBell. U.S. 2,659,107, Nov. 17. Forming hollow plastic articles.

CLOSURE ATTACHMENT. A. M. Schwartz and J. T. Willoughby (to Northrup Aircraft). U.S. 2,659,462, Nov. 17. Attachment for plastic enclosures.

LAMINATE. G. B. Watkins (to Libbey-Owens-Ford). U.S. 2,659,686, Nov. 17. Laminated glass.

SPRAY. R. J. Kerr (to Protective Coatings). U.S. 2,659,704, Nov. 17. Self-spraying artificial snow.

RUBBER. C. F. Fisk and A. W. Meyer (to U. S. Rubber). U.S. 2,-659,706, Nov. 17. Compound of phenolic resin and butadiene-acrylonitrile copolymer.

CURING AGENTS. O. G. Youngquist, M. A. Smook, and R. E. Brooks (to Du Pont). U.S. 2,659,707, Nov. 17. Heating chlorosulfonated polyethylene in the presence of channel black.

RESIN BLENDS. S. E. Berger and K. M. Webb (to U. S. Rubber). U.S. 2,659,708, Nov. 17. Mixtures of plasticized vinyl resin and thermoset phenol-aldehyde resin.

VINYLIDENE CHLORIDE. A. F. Daglish and D. Faulkner (to Distillers). U.S. 2,659,709, Nov. 17. Stabilized polyvinylidene chloride.

RESIN. R. W. Martin (to General Electric). U.S. 2,659,710, Nov. 17. Phenol-aldehyde epichlorhydrin reaction products.

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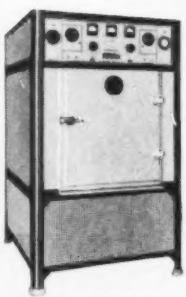

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and E. L. Wittbecker (to Du Pont). U.S. 2,659,711, Nov. 17. Chelate polymers from tetraketones.

RESINS. R. B. Thompson and H. S. Bloch (to Universal Oil). U.S. 2,659,712, Nov. 17. Resinous condensates of aromatic ketones and amines.

POLYAMIDES. E. E. Magat (to Du Pont). U.S. 2,659,713, Nov. 17. Process for preparing polyamides.

POLYMERS. D. Harman and A. R. Stiles (to Shell). U.S. 2,659,714, Nov. 17. Polyallyl phosphinates.

POLYMERS. H. W. Coover, Jr. and J. B. Dickey (to Eastman Kodak). U.S. 2,659,715, Nov. 17. Alpha-acylaminomethyl acrylonitrile polymers.

POLYMERS. H. F. Park (to Monsanto). U.S. 2,659,716, Nov. 17. Polymerization of vinyl halides with adipoyl peroxide and hexamethylene diamine.

POLYMERIZATION. H. F. Park (to Monsanto). U.S. 2,659,717, Nov. 17. High temperature polymerization of styrene.

EXTRUSION. O. A. McNamee (to U. S. Steel). U.S. 2,659,932, Nov. 24. Apparatus for extruding insulation around conductors.

FABRICATION. J. Q. Burgess (to Plax). U.S. 2,659,934, Nov. 24. Making articles from biaxially orientated thermoplastic sheet.

SPONGE. H. G. Hammon (to C. L. Wilson). U.S. 2,659,935, Nov. 24. Compressed vinyl sponge.

FLOTATION BODY. J. J. Hoffman (to U. S. Rubber). U.S. 2,660,194, Nov. 24. Flotation block of cellular polystyrene.

ISULATION. N. F. Arone (to General Electric). U.S. 2,660,215, Nov. 24. Melamine electrical laminate.

FLAMEPROOFING. G. E. Walter, I. Hornstein, and C. A. Sheld (to Glenn L. Martin). U.S. 2,660,542-3, Nov. 24. Halogenated polyalkenyl phosphate esters.

POLYMERS. C. F. Feasley (to Socony-Vacuum). U.S. 2,660,572, Nov. 24. Aromatic hydrocarbon-formaldehyde resins.

RESIN. W. J. Lantz and J. M. Walters (to Electro-Chemical Engineering). U.S. 2,660,573, Nov. 24. Condensates of furacrolein, furfural, and formaldehyde.

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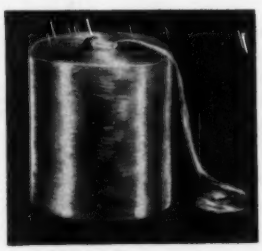
Thus writes Mr. E. M. Elliott, General Manager, Plas-Steel Products, Inc., of Walkerton, Indiana. Plas-Steel supplies more than a million glass rod blanks, annually, to the fishing rod industry.

L·O·F Garan treatments, applied to roving, chopped strand, textile yarns and Fiber·Glass cloth, impart great flexural, compressive and tensile strength, and increase the translucency of reinforced plastics.



L·O·F roving is made of glass fibers possessing tremendous tensile strength (250,000 lbs. per sq. in.).

Laminates reinforced with Garanized glass roving, cloth or chopped strand, absorb less water. End products, therefore, have improved resistance to weathering; are suitable for a wide range of outdoor applications.

For technical data or consultation, contact your local L·O·F office (offices in 26 major cities). Or write, Libbey·Owens·Ford Glass Company, Fiber·Glass Division, 1534 Wayne Building, Toledo 3, Ohio.

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BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Opportunities in Plastics," by Denis A. Dearle

Published in 1953 by Vocational Guidance Manuals, Inc., 45 W. 45 St., New York 36, N. Y. 128 pages. Price $1.00.

This book is aimed at the young man who is considering a career in plastics. In addition to job descriptions, the book includes elementary information on the various plastics materials, their properties and applications, and the major chemical companies producing them, as well as brief outlines of various molding methods. In discussing job opportunities, the author deals primarily with the production phase of plastics, both on the material production and molding level. Some of the jobs described are compression press operator, injection and extrusion molder, preform press operator, molding plant foreman, finishing supervisor, research chemist, general laborer, blender operator, color inspector, kettle operator, product designer, etc. Wage scales and suggested methods for getting started in the field are also included.

"Government Contracts Simplified," by George W. Lupton, Jr.

Published in 1953 by The Lupton Co., Box 4862, Cleveland Park Branch P. O., Washington, D. C. 578 pages. Price $10.00; monthly supplement $5.00 for 6 months.

The laws and regulations governing the procurement procedures of various agencies of the U. S. Government have been digested and systematized for the prime contractor and the subcontractor in this reference guide. The author, who has both an industrial and legal background, has covered every major branch of the Government that purchases in any large degree, describing its purchasing set-up, and the steps necessary to get on a bid list, to make a bid, and to negotiate a contract. He has also described the different types of contracts used by the Government and the practical and legal implications of various clauses. In order to keep the volume up-to-date, a monthly supplement is to be published, revising the original text as changes occur. The first supplement is included with the volume.

"Symposium on Plastics Testing—Present and Future"

Published in 1953 by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 78 pages. Price $2.00 to non-members, $1.50 to members.

The papers presented in this symposium constitute a progress report on the work which has been done in the field of plastics testing standards, as well as a guidepost to the direction which further efforts must take. They examine the plastics testing situation with regard to mechanical, thermal, optical, molding and permanence properties, and conditioning and weathering of plastics, including a study of internal states of stress in cross-linked polymers.

Ion exchange—The theoretical principles of ion exchange processes are explained in simple language in this 16-page booklet. Also discussed are ion exchange applications including water softening, alkalinity reduction, de-ionization, silica removal, removal of metal ion contaminants, recovery of metallic ions, recovery and purification of organic bases, etc. Examples of how ion exchange has solved specific industrial problems are also included. *Rohm & Haas Co., Resinous Products Div., Washington Sq., Philadelphia 5, Pa.*

Cylinders—Three catalogs describe the company's complete line of air and hydraulic cylinders, consisting of over 800 basic models. Catalog 701 presents photographs, construction features, capacities, sizes, and specifications for the Model 300 Series, designed for 150 p.s.i. air or 300 p.s.i. hydraulic service, as well as a list of accessories for use with this series. Catalog 721 covers the models in the 2000 series, built for 2000 p.s.i. oil hydraulic service. Catalog 741 deals with hydraulic cylinders in the 3000 series—for 3000 p.s.i. oil hydraulic service. To facilitate ordering of replacement parts, each catalog contains a cut-away view of a cylinder on which all parts are identified by number and name. *The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.*

Plastisols—What vinyl resin plastisols are, how they are processed, equipment needed, and their average range of physical properties are the subjects discussed in simple terms in this 4-page presentation. Since specific formulations and processing methods are required for individual applications, the present treatment is of a general nature. *Flexible Products Co., P. O. Box 306, 312 Dobbs St., Marietta, Ga.*

Phosphorescent plastics—The techniques for molding luminescent plastics products are described in an 8-page brochure. Resins available for this operation, and end products to which it can be applied, are discussed and illustrated. Information on duration of glow, toxicity, etc., is also included. *Luminous Resins, Inc., 166 W. Washington St., Chicago 2, Ill.*

Plasticizers—How to use the company's Pycal plasticizers (40, 60, 62, 94, 140, and 194) in polyvinyl acetate emulsion adhesives, and the advantages claimed for them, are discussed in this 26-page application bulletin. Included are tables presenting test data on chemical and physical properties of the plasticizers, comparative resistance to water spotting, and comparisons of viscosity and permanent tack. Formulations using these plasticizers are suggested for applications in pressure-sensitive, bookbinding, wax paper, cellophane and cellulose acetate, aluminum foil, chipboard, fabric laminating, and waterproof adhesives. *Atlas Powder Co., Industrial Chemicals Div., Wilmington 99, Del.*

Corrosion—Three booklets, all dealing with various aspects of the application of plastics materials in corrosion prevention work, present reference data and reprints of published articles on this subject. The first contains 15 reference sheets covering rigid polyvinyl chloride, polyester-glass laminates, saran, styrene copolymer, furnace cement, phenolic cement, sulfur cement, sili-

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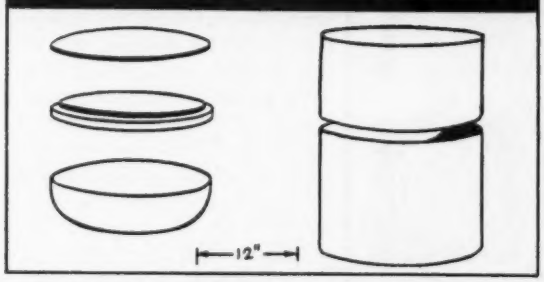

The Chemold Company is presently equipped to mold glass fiber polyester parts like those shown above and below. In addition to flat or ribbed sheets 32" x 96", other compound curvature shapes may be produced 3' wide by 8' long, or 6' wide by 6' long using Chemold's 200-ton steam-heated hydraulic presses.

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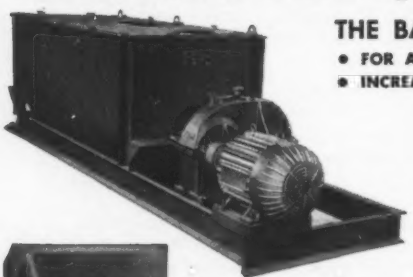

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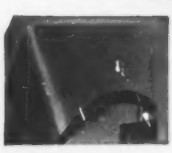

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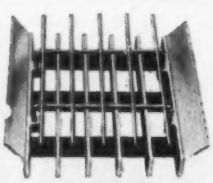
The Magnetic Grate consists of highly saturated Alnico No. 6 magnets and intervening steel bars.
Placed in the throat of the hopper, the grate attracts every ferrous object from material being loaded in machine. Retaining this and all other large debris of all kinds—rags, sticks, stones, paper, strings, and other foreign objects, it helps prevent damage to expensive machinery.
The grate can readily be lifted out for removal of tramp iron and debris. Magnets are of permanent type. They are always in operation because no one can turn the magnetic force on or off. It is always constant. The Magnetic Grates are available in sizes from 2"x4" up to 8 feet square. Grates of virtually any size or shape can be furnished to meet unusual requirements.



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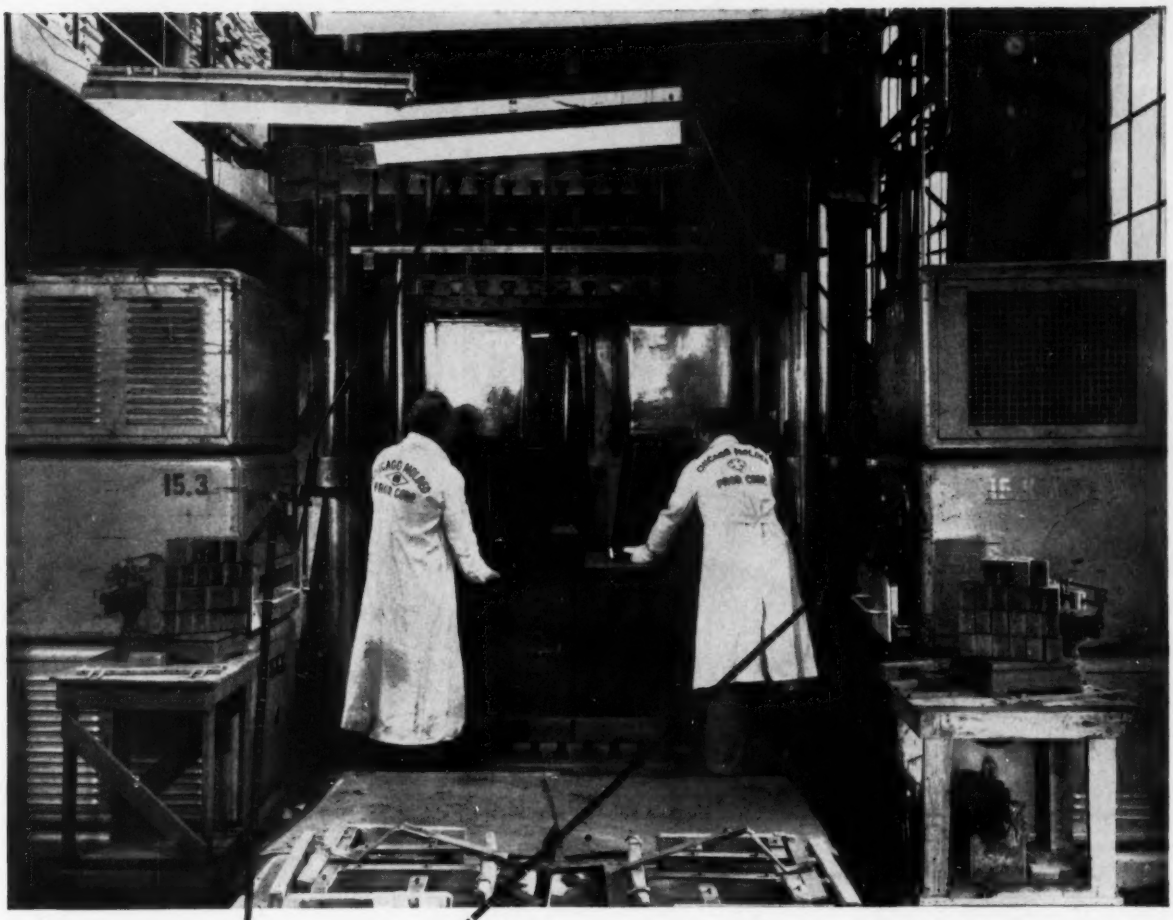
cate cement, epoxy cement, bleach-resistant cement, plasticized vinyl resins, styrene-butadiene coatings, chlorinated rubber coatings, and neoprene rubber. The second contains reprints on the following subjects: plastics processing equipment, fabricated plastics in the plating industry, plastic pipe; it also presents a number of technical bulletins with specification information on some of the company's materials. The third booklet has reprints of articles on plastic materials of construction, protective coatings, acid resistance of plastics, as well as some of those contained in the second booklet mentioned. *The Atlas Mineral Products Co., Mertztown, Pa.*

Plastisols—Bulletin 141 describes properties of plastisol compounds formulated by the company. It also lists several applications, suggests their extension to other uses, and points out that the company's research facilities are equipped to solve problems which may arise from the application of these formulations to new uses. *Chemical Products Corp., King Philip Rd., E. Providence, R. I.*

Lighting—A line of eleven types of plastics lighting equipment is presented in this 8-page preprint of a section to appear in the 1954 Sweets' Catalog. They include acrylic modular ceiling lighting systems (see MODERN PLASTICS, *31*, 108 (Nov. 1953) as well as pendant units. Structural installation drawings, illumination data, and information on acoustical effectiveness of the company's baffles and use of plenums as air diffusers are included. *The F. W. Wakefield Brass Co., Vermilion, Ohio.*

Cellulose acetate—Semi-technical 16-page illustrated booklet, addressed to the injection molder and extruder, summarizes the outstanding properties and characteristics of the company's six formulations of acetate molding powder. End products molded of these compounds are shown. *Celanese Corp. of America, 180 Madison Ave., New York 16, N. Y.*

Converting machinery—Bulletin 311 contains the latest product developments in the company's line of converting machinery. The equipment



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The TV cabinet production line at Chicago Molded Products Company runs 24 hours a day during the peak TV selling season. Since dependability is at a premium, the company selected THERMEX* Plastic Preheating Apparatus for the job of heating the 29-pound cabinet preforms, on the basis of past experience with this efficient, reliable equipment. Now, servicing for repairs or tube replacement is held to a minimum.

Operating experience has proved the dependability of THERMEX Preheating Apparatus—that's why it is the choice of the great majority of contract molders of king-size plastic parts. Find out how *you* can improve production efficiency. Have a THERMEX field engineer study your operations. Call or write The Girdler Company, Thermex Div., Louisville 1, Kentucky.

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covered includes winders, unwinders, coaters, waxers, board laminators, polyethylene extrusion laminators, embossers, and several auxiliary units. *Dilts Machine Works, Div. of The Black-Clawson Co., Fulton, N. Y.*

Vacuum molding—Specifications, applications, and advantages of a newly designed vacuum forming and deep drawing machine for rigid and soft thermoplastic sheet are presented in this 6-page folder. The information given covers such topics as mold cost, cycle speed, personnel requirements, range of end products which can be molded on the machine, etc. *Hydro-Chemie Ltd., 21, Dreikönigstrasse, Zurich, Switzerland.*

Hydraulic equipment—A complete line of compression and transfer molding presses from 100 tons up, as well as hobbing presses, small production and laboratory presses, high-pressure pumps, and accumulators is described and illustrated in Bulletin 5200-A. Also included is a section on Hydrolairs, small production presses that take their power entirely from shop air lines. *American Steel Foundries, Elmes Engineering Div., 1150 Tennessee Ave., Cincinnati 29, Ohio.*

Solvents—This reference chart lists physical specifications and suggests general uses for eight industrial solvents. *John B. Moore Corp., Lee Bldg., P. O. Box 3, Nutley 10, N. J.*

Labels—Form 11 describes the company's plastic, self-sticking "write-on-it tape." Writing on this tape with any blunt, pointed instrument (stylus, pen, typewriter, etc.) produces a sealed-in-plastic message that is smearproof, greaseproof, waterproof, and acid resistant. Also included are descriptions of recently developed pressure-sensitive paper tapes, both flatback and crepe, used in masking, holding, bundling, and sealing. *Labelon Tape Co., Inc., 450 Atlantic Ave., Rochester 9, N. Y.*

Temperature control—Bulletin F-6149 provides basic information on the problems of industrial process temperature control. It contains sections on the selection of the sensing element, the placement and use of sensing elements, terminology commonly used in the field of temperature control, and the rules to follow in selecting the proper method of temperature control. The bulletin also gives an explanation of the various types of control systems offered by the company, indicates where to use each system, and suggests the instruments required for best control results. *Wheelco Instruments Div., Barber-Colman Co., Rockford, Ill.*

Catalog—A line of styrene rods, tubing, and sheets; Tulox TT tubing; Tenite II rods and Tygon tubing and sheet; acrylic fittings; plastics-covered steel; Interlox plastic splicers and channels; and other shapes are listed in General Plastics Catalog and Handbook. The catalog itemizes shapes, specifications, sizes, dimensions, and weights, and also contains technical data for each group of plastics featured. *Julius Blum & Co., Inc., Carlstadt, N. J.*

Dehydraters—A line of equipment for the removal of moisture from air or other gases in industrial, processing, and laboratory installations is

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G-E POLYESTER RESINS reinforced with GLASS FIBER

Many of the cake trays now used by Continental Baking Company are made of General Electric polyester resins reinforced with glass fiber. Molded in this new plastics material by Fabricon Products, Inc., River Rouge 18, Michigan, these trays benefit Continental all the way from wrapping machine to grocer's shelf. Here's why:

G-E polyester-glass plastics produces trays which are not only far lighter than steel but actually stronger on a weight-to-strength basis! Easy to handle, they give long service life. Dentless, moisture-resistant and rustless, they cut maintenance time . . . never need to be refurbished . . . stay good looking.

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described in Bulletin 16.0.081. Dehydration is accomplished by a charge of solid adsorbent contained in each unit, which adsorbs water until its capacity is approached; at that point it is reactivated by removing the adsorbed water and is then ready to function again. For continuous drying, dual adsorber units are required, one being used for drying while the other is being reactivated. The bulletin lists complete specifications and contains application data. *J. F. Pritchard & Co., Equipment Div., 210 W. 10th St., Kansas City 5, Mo.*

Test equipment—A line of non-destructive and physical test instruments is presented in Bulletin 32. It includes cyclographs, tramp metal detectors, ultrasonic metroscopes, electronic micrometers, pipe finders, leak detectors, power equipment testers, and the like. *J. W. Dice Co., 1 Engle St., Englewood, N. J.*

P.V.C.—This technical data bulletin describes the series of polyvinyl chloride resins manufactured by the company and the application of each type. Graphs and tables on various properties of the material, which the firm supplies as unformulated powder for calendering and extruding operations, are included. *The Dow Chemical Co., Midland, Mich.*

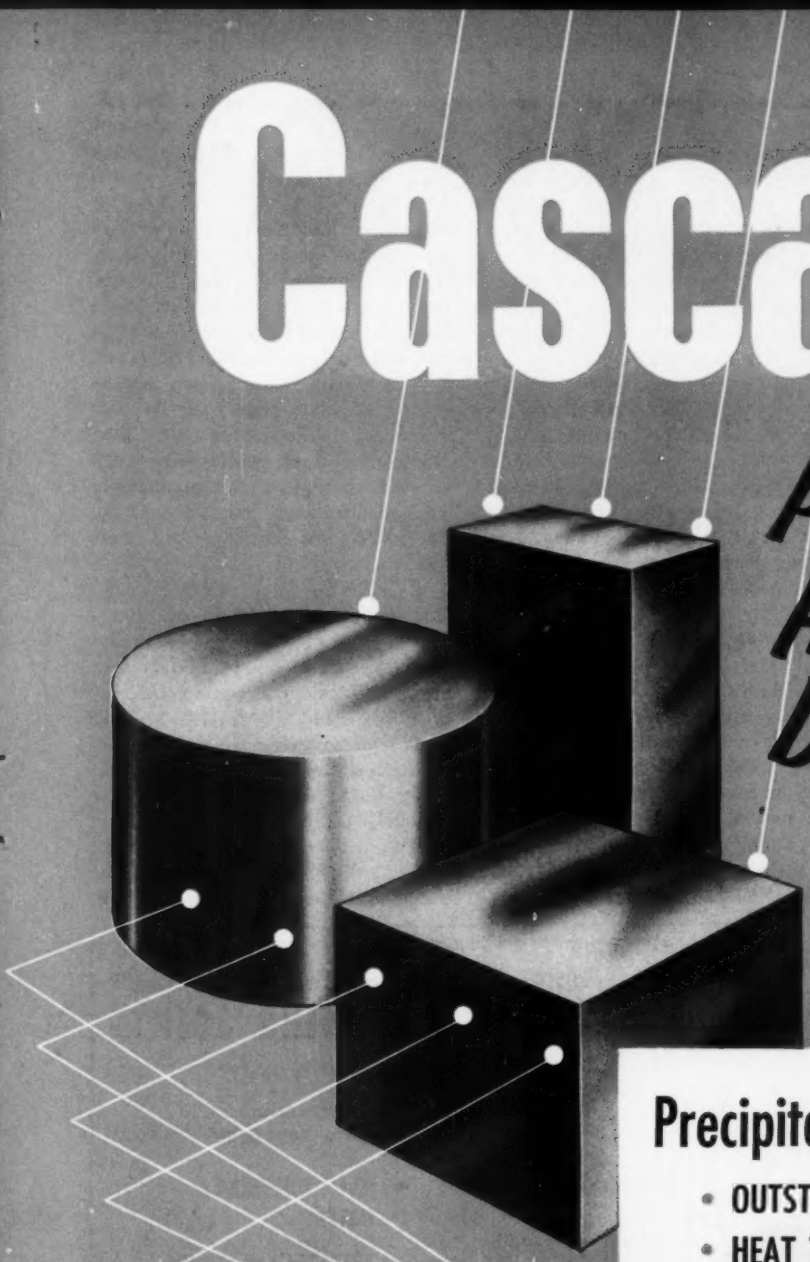
Film and sheeting—Principal markets for the company's cellulose acetate film and sheeting, as well as a table of properties are presented in this 4-page folder. Information on available thicknesses, sizes, colors, finishes, and fabricating methods is also included. *Celanese Corp. of America, 180 Madison Ave., New York 16, N. Y.*

Low-pressure molding—Construction and operation of a 100-ton press for molding glass reinforced plastics is described in 4-page leaflet D53/63. The press, designed as a self contained unit, has a platen area of 4 by 3 ft., maximum daylight of 7 ft., and a 4-ft. stroke. The leaflet also lists specifications for the complete range of sizes (100 to 250 tons) produced by the company. *T. H. & J. Daniels Ltd., Stroud, Glos., England.*

Shell molding—Of interest to foundrymen, casting buyers, and product engineers, this 36-page booklet discusses the methods, materials, and

Cascade

Precipitation Hardened Die Steel for Plastic Molds



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equipment used in shell molding. It also deals with the problems commonly encountered with this process and suggests possible causes and solutions. *Durez Plastics & Chemicals, Inc., N. Tonawanda, N. Y.*

Facilities—This 4-page folder outlines the company's services and facilities for molding, extruding, and fabricating Kel-F, Teflon, and nylon. Properties and applications of these materials are also described. *Flek Corp., 2252 E. 37th St., Los Angeles 58, Calif.*

Engravers—A line of tracer-guided engraving machines in a range of sizes is listed in this 24-page catalog, together with their industrial applications in the engraving of plastics, metal, glass, and wood. Information on calibrating, profiling, and slotting methods is also given. *New Hermes Engraving Machine Corp., 13 University Place, New York 3, N. Y.*

Insulation—Data sheet 10-227 offers a comparison of the properties and performance of leading silicone electrical insulating resins. Reviewed are five coating and impregnating varnishes, an adhesive, and six bonding and laminating resins. Properties which are compared include dielectric strength, weight loss after 3 hr. at 250° C., solids content, color, specific gravity, viscosity, drying time, flash point, solvents, thinners, and shipping weights. Recommended applications for each of the resins are presented. *Dow Corning Corp., Midland, Mich.*

New company—Aims and operations of a newly formed company, which will initially produce ammonia and urea, are outlined in this 16-page brochure. Information on executive personnel, process flow, and end uses is also given. *Grace Chemical Co., 7 Hanover Sq., New York 5, N. Y.*

Plastics and plastics resins—Properties and uses of the company's more than 50 plastics and resins as well as applications and finished products are presented in the 12-page "1954 Condensed Reference File." It covers molding and extrusion materials, wire and cable coverings, bonding resins, protective coating resins, laminating plastics, rigid sheets, flexible film and sheeting, and calendering materials. *Bakelite Co., a Div. of Union Carbide and Carbon Corp., 300 Madison Ave., New York 17, N. Y.*

Vacuum molding—A general discussion of the vacuum forming process, including mold materials and designs, advantages, comparisons with other processes, and applications in the field of packaging, novelties, toys, displays, lighting, etc., is presented in this 4-page bulletin. Also contained is information on the features, operations, and specifications of the company's automatic-cycle vacuum forming machine Model 50-20. *Vacuum Forming Corp., Port Washington, N. Y.*

Air pollution—Methods of abatement of gases and vapors (waste dispersal by use of stacks, absorbers or scrubbers, catalytic combustion, incineration, and adsorption) to clear the air of pollution are described in air Pollution Abatement Manual Sheet P-11. As is pointed out in the manual, community relations are sharply affected by air pollution; clearing the air often improves them. Price 60¢. *Manufacturing Chemists'*

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Spiral Tubing, another outstanding C-D-F product, is an important new material for the progressive, cost conscious design engineer (and purchasing agent). It is a high strength plastic made from paper or fibre that is spirally wound, then impregnated with phenolic resin or insulating varnishes and carefully cured at high temperatures. The resulting tubes (round, square, rectangular or formed to special shapes) are stiff, sturdy, resistant to crush, with good tensile strength.

This unique product has good dielectric strength with low dielectric loss properties. Moisture resistance and dimensional stability is easily controlled in the manufacturing process. The wide variety of sizes, shapes, forms; the strength; low cost; ease of fabrication; speed of delivery; all combine to make C-D-F Spiral Tubing worthy of your investigation.

PRIMARY APPLICATIONS

COIL FORMS OF ANY SIZE OR SHAPE
- for tuned or untuned RF, IF, oscillator, and other coils used in radio, television, electronic circuits
- for solenoids, relays, circuit breakers
- for transformers
- for permeability tuners

INSULATORS
- for selenium rectifiers
- for electric motors
- relays

BUSHINGS OR SPACERS
- armature shaft spacers
- for mechanical support

SHIPPING PROTECTORS AND FOR SPECIALIZED PACKAGING

BOBBIN TUBES

BODIES FOR PAINT ROLL APPLICATORS

AS A COMBINATION MATERIAL
- with other C-D-F high strength plastics or electrical insulating materials

SIZES

The round tubing ranges from 3/32 to 8" ID, with wall thicknesses from .0075 to ¼". The minimum ID of square and rectangular tubing is ⅜", with 2⅛" the maximum ID. Wall thicknesses range from .010 to 3/32".

Standard lengths are from 2 to 4', with special sizes and grades, plain or impregnated, open for your discussion with our C-D-F sales and engineering staff.

FABRICATION

Spiral Tubing is readily sawed, punched, drilled, tapped, riveted, stamped, painted, depending on the grade; it is suitable for automatic machine operations, but not recommended for conventional machine threading. Waxing or varnish impregnation to improve moisture resistance is usually done on the finished coils by the user.

GRADE SELECTION

C-D-F has mass production facilities for both the manufacture and fabrication of eighteen distinct grades of Spiral Tubing. For example, there's a special punching grade, fine for punching rectangular or square holes near the end of the tube. A relatively soft tube is supplied for difficult stapling or riveting. C-D-F makes high strength automotive electrical bushings from a very hard tubing with high axial compressive strength. Combinations of kraft, chipboard, Diamond "fish paper" Insulation, and other materials are available.

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Remember, C-D-F has production know-how, years of experience in electrical insulation. See your C-D-F sales engineer. Write now for new 1953 spiral tubing folder, a workbook showing grades, applications, properties.

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for position with **IBM** TRADE MARK

Engineering Laboratory
Endicott, N.Y.

Graduate engineer with at least five years' experience in application or testing of thermoplastic and thermosetting materials. Good knowledge of physical properties and design limitations essential.

Excellent salary, working conditions and opportunities for professional development; exceptional employee benefits, moving expenses paid.

Write, giving full details including education and experience, to:

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INTERNATIONAL BUSINESS MACHINES
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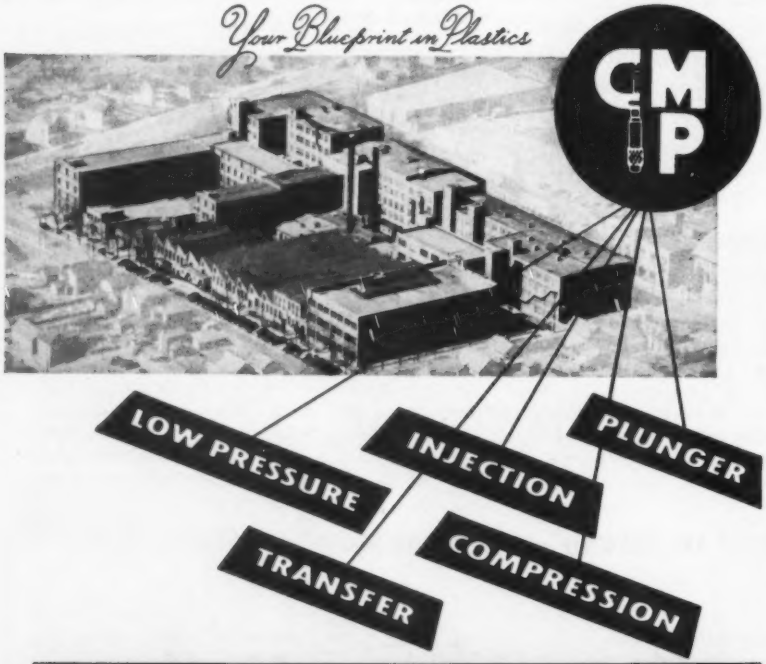
Your Blueprint in Plastics



Consolidated molded products corporation
SCRANTON 2, PENNSYLVANIA
SALES ENGINEERING OFFICES IN NEW YORK BOSTON BRIDGEPORT
DETROIT PHILADELPHIA CLEVELAND MILWAUKEE INDIANAPOLIS

Association, Inc., 246 Woodward Bldg., 15th & H Sts., N. W., Washington 5, D. C.

Compressor equipment—Catalog 810 lists the company's complete line of tank- and base-mounted and portable air compressors, ranging in size from ¼ to 20 hp., and from 2.2 to 105 cu. ft./min. in capacity. *Binks Mfg. Co., 3122 Carroll Ave., Chicago 12, Ill.*

Electric heaters—Principal industrial electric heating applications and methods are described in 32-page booklet, "101 Ways to Apply Electric Heat." The applications include far-infra red heating of plastics; heating of plastics dies, molds, and platens; cleaning and degreasing; melting soft metals; and a host of others. Each application is illustrated with process photographs and diagrams of the type of heater best suited for it. *Edwin L. Wiegand Co., 7503 Thomas Blvd., Pittsburgh 8, Pa.*

Colorants—Color samples of inorganic pigments (52 hues, ranging from black to lemon yellow), which are formulated for use with polyvinyl chloride, cellulose acetate, melamine, styrene, silicones, methacrylates, polyesters, and other materials, are presented in this 8-page folder. The color samples are given in two groups—full strength and "let-downs" which consist of one part color to one part titanium dioxide. *Ferro Corp., Color Div., 4150 E. 56th St., Cleveland 5, Ohio.*

Silicones—Data sheet 5-104 describes eight silicone release agents—one fluid, four emulsions, one solvent solution, and two coating resins—employed in the plastics industry, and lists the major types of plastics resins for which they are respectively used. Application methods and optimum concentrations are given for each of the eight silicones. *Dow Corning Corp., Midland, Mich.*

Metallic soaps—Applications of the company's sodium stearate T-1 and aluminum stearate No. 22 as gelling agents in the production of plastigels and as viscosity controllers and stabilizers for vinyl plastisols and organosols are described in Technical Service Bulletin G-5. Required proportions of gelling agent are indicated, and results of Gardner

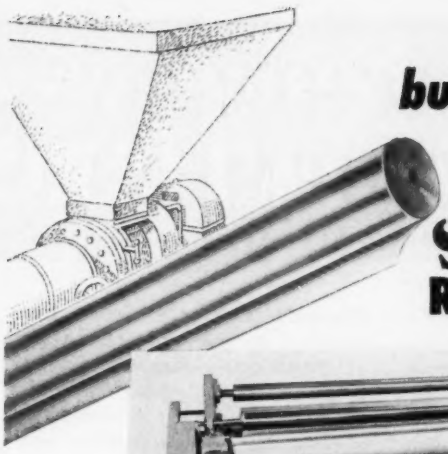
Putty Consistometer tests, in graph form, are presented. *Witco Chemical Co., 260 Madison Ave., New York 16, N. Y.*

Plasticizer—Technical bulletin presents details of product properties and applications of Pycal 170, a secondary plasticizer for polyvinyl chloride. When used in combination with dioctyl phthalate, it is said to improve the low-temperature properties of that plasticizer and reduce volatile loss. Lower soap extraction losses and a lesser tendency to mar varnish and lacquer surfaces are also said to be realized. *Atlas Powder Co., Industrial Chemicals Dept., Wilmington 99, Del.*

Instruments—The first issue of "Newsletter," a 4-page sesquimonthly bulletin describes a new electronic counting device for automatic hardness testing, a computer for use with Gardner color difference meters, portable gloss meters, and other test equipment. Future issues will also deal with the subject of instrumentation. *Gardner Laboratory Inc., 4723 Elm St., Bethesda 14, Md.*

Ammonia production—Yield and cost advantages, principal operating features, and economics of a new process for the production of ammonia is described in this booklet. The new method includes a reforming step which takes advantage of the high pressures at which natural gas is available; by conserving the potential energy of the feed and producing synthesis gas at relatively high pressure, savings in compressor horsepower of 25 to 35% are said to be obtainable. The booklet also describes a new reactor designed to prolong catalyst life and to lower the operating costs of the process. *Chemical Process Div., The M. W. Kellogg Co., 225 Broadway, New York 7, N. Y.*

Chemicals—Over 400 chemicals, from acetanilid to zinc sulfate, available in bulk to industrial manufacturers through the nation-wide distribution facilities of the company, are listed in this 6-page catalog. Distribution service includes warehousing and delivery of chemicals in original containers. *McKesson & Robbins, Inc., Chemical Dept. 155 E. 44th St., New York 17, N. Y.*



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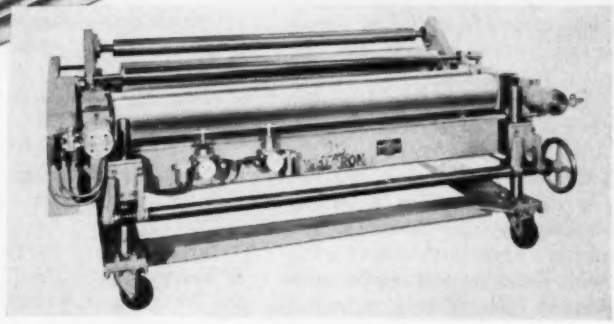
SPECIAL
Requirement



EMBOSSER ON WHEELS

DESIGNED BY WALDRON

New requirements call for new machine designs. Shown above is a specially designed embosser arranged with vertical adjustment to receive plastic film on the extrusion die.

It is typical of the custom built machinery currently being designed by WALDRON to solve those unusual processing problems posed by new special requirements.

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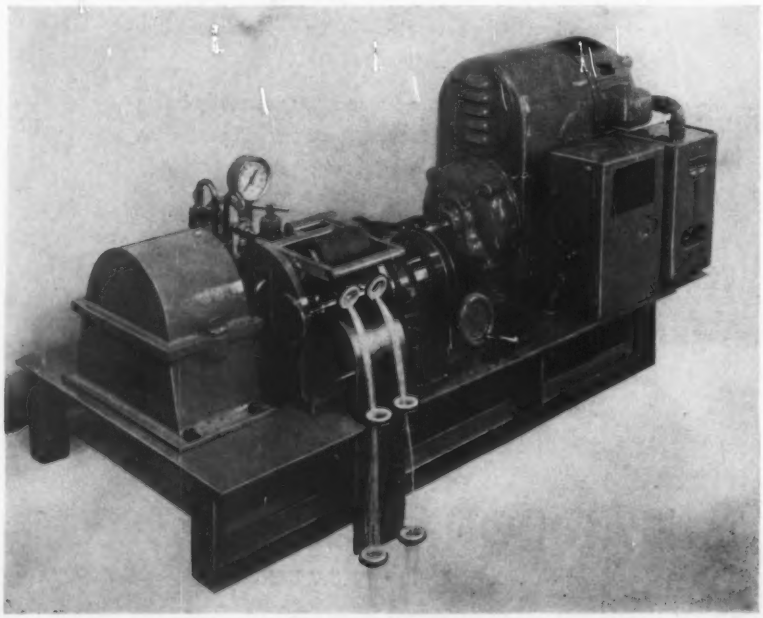
NEW MACHINERY AND EQUIPMENT

Hydraulic Press—Using air cylinder pressure for 90% of die travel and using power furnished by a self-contained hydraulic unit for the pressure stroke, this low pressure press for molding reinforced plastics is fabricated from structural steel. The unit, offered by Davidson-Kennedy Co., 1092 Jefferson St., Atlanta, Ga., is manufactured in a variety of strokes, daylight openings, and pressures, and is said to be readily movable, requiring only air line connections and electricity for control units.

Roving Cutter—Of interest to the reinforced plastics industry is a new roving cutter which cuts fibrous glass to be used in the building of preforms. The machine was engineered by Turner Machine Co., Inc., 28 Maple Ave., Danbury, Conn.

In operation, the roving is fed through a cemented carbide backing plate by means of an air stream, and sheared to the desired length by a cemented carbide cutting head. The air stream, in addition to feeding the glass fibers, also opens them and cools the cutter head. Length of cut is controlled by an adjustable feeding mechanism.

The company states that its cutting method eliminates a considerable amount of static electricity.



Turner's roving cutter has adjustable feeding mechanism for control of length of cut

Elevator Table—In-plant handling of heavy bar stock is facilitated by the Portelevator, a wheeled elevator table with a capacity of 2000 lb. and vertical travel of 14 in., manufactured by The Hamilton Tool Co., Hamilton, Ohio. Minimum height of table from floor is 20 inches. Table surface is 18 by 20 in., and the hand crank which elevates it is located at the side so that bar stock may extend over each end of the table without interfering with the raising or lowering operations.

The table top has four rollers over which the bar stock moves and two slots to enable the chain of an overhead crane to be wrapped around the stock.

Hamilton Tool's wheeled elevator table for in-plant handling of heavy bar stock has capacity of 2000 pounds

The unit is used to receive heavy billets at the receiving dock, transport them to the stockroom until needed, and move them from there to the sawing machine where the material is height-positioned and fed directly to the saw.

Imprinting Machine—Flat, rigid, and relatively thick objects (floor tiles, for example) may be imprinted with trademarks, identification copy, and the like by means of a modified model of the Markcoder 3M, manufactured by Adolph Gottscho, Inc., Hillside 5, N. J.

The material to be printed is stacked in the machine's magazine and fed automatically, one piece at a time, to the printing section. The printed piece is discharged at the other end of the machine to a tote box, conveyor, or the like.

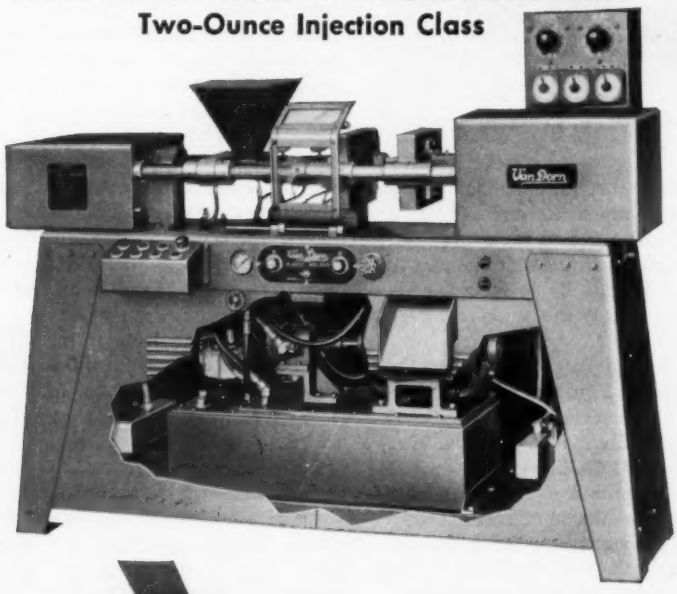
The printer operates at speeds up to 60 units per min., and is adjustable to handle objects from 2 by 2 in. to 9 by 9 in., from 1/16 to 1/4 in. thick.

Injection Machine—Up to 600 shots per hr. are claimed for Model 175T-4/6-oz. injection molding machine, produced by Reed-Prentice Corp., Worcester 4, Mass.

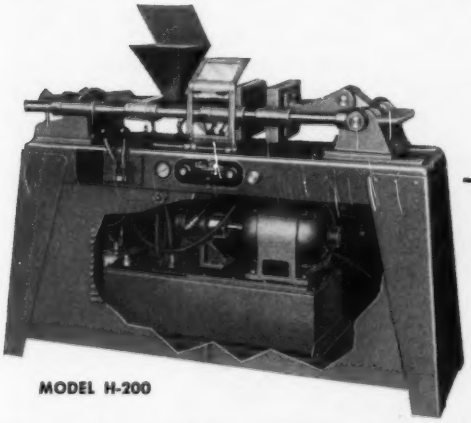
The unit is designed for continuous molding of small thermoplastic items. It develops 175 tons mold clamping pressure through a double shear link mechanism and has a mold stroke adjustable between 5

Produce Plastics Profitably With This
VAN DORN Equipment

Model H-200—Leader in the Semi-Automatic Two-Ounce Injection Class



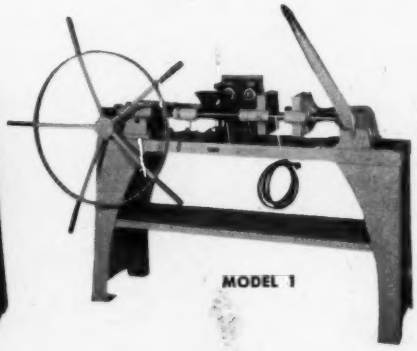
This ultra-modern press molds practically all thermoplastics including nylon. It completes up to 6 operating cycles per minute. Push button controls are safe, simple and convenient. Compact and rugged, the unit is quiet and economical in operation. Sliding gate with interlocking safety devices starts the cycle. Solenoid valves close the molds. Injection and dwell are controlled by first of three timers on the rear panel. Center timer regulates recharging of heater. The third timer controls the length of the mold close cycle; when time runs out, molds automatically open and parts are ejected. Operator opens safety gate, removes product and then closes gate to begin the next cycle . . . Variable voltage transformers in conjunction with thermostatic units control the temperatures on the two heating zones accurately.



MODEL H-200

Power Operated, Lever Controlled Presses

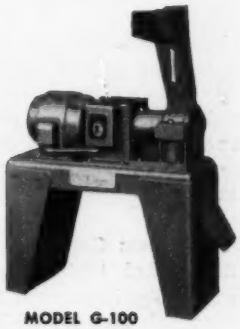
2-oz. or 1-oz. capacity. These low-cost units operate 8 hours for under a dollar and use inexpensive molds. Can easily be set up in twenty minutes by one man.



MODEL 1

Manually Operated Press

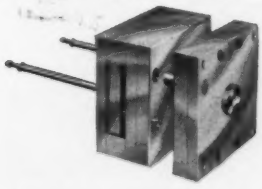
1-oz. capacity. This press is ideal for smaller jobs, experimental work and technical training.



MODEL G-100

Plastic Grinder

Grinds up rejects, waste, etc., for re-use. Ruggedly made, designed for easy cleaning.



Mold Bases

Available from stock for all Van Dorn presses.

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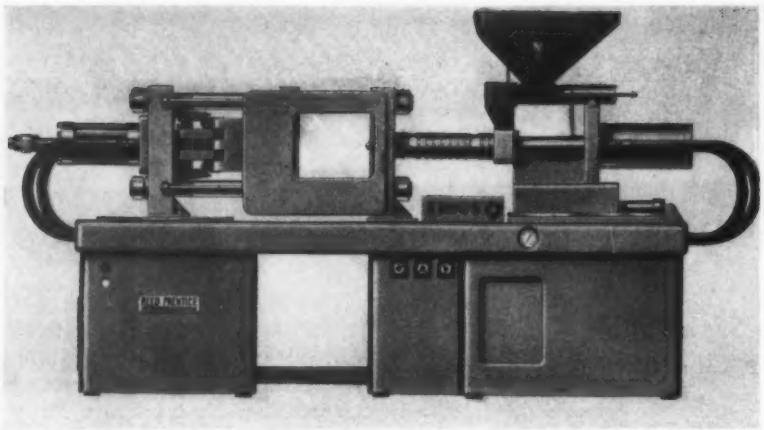
Cable Address: "VANDORN" Cleveland



Reed-Prentice's Model 175T-4/6-oz. injection machine has 75-lb./hr. plasticizing capacity

and 8 inches. Four tie bars, 3-in in diameter, support the 22- by 21¼-in. die platens, which will accommodate molds up to 24¼ by 13 inches. Rated projected casting area in mold is 75 sq. in.; maximum mold thickness is 14 in.; minimum mold thickness is 6 inches. Plasticizing capacity is 75 lb. per hr. in a heating cylinder with ceramic elements. Feed hopper holds a 200-lb. plastics material drum at a 45° angle. Heater temperature is controlled by dual proportioning-type pyrometers.

A stuffing arrangement, furnished as standard equipment, permits shots of 6 oz. or more through multiple strokes. An optional low-pressure die closing unit allows machine to operate automatically on fast cycles without danger of damage to mold. Safety doors at front and rear of the unit, when opened, cause dies to open at any part of cycle. The doors are hydraulically and electrically interlocked.

Thickness Gage—Small-diameter, thin-walled tubing can be gaged with a new instrument developed by Tracerlab, Inc., 130 High St., Boston 10, Mass. A radioactive source of beta radiation, moved inside the tube in relation to a radiation-detecting sensing unit, is the heart of the device. Changes in the thickness of the wall of a tube affect the amount of radiation passing through the wall and are translated into thickness readings recorded by pen trace on a chart.

Concentricity of tubing can be measured by the instrument in similar fashion.

The gage is custom produced to fit the user's requirements. While standard components are used to a large extent, the beta ray source and the detecting elements are generally designed specifically to measure the type of product the user is interested in.

Hydraulic Equipment—New line of hydraulic cylinders, introduced by The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio, incorporates a full range of mountings, including foot, side lug, centerline, clevis, base, flange, rabbet, trunnion, and subplate mountings. Units have spring loaded piston rod packings for improved sealing.

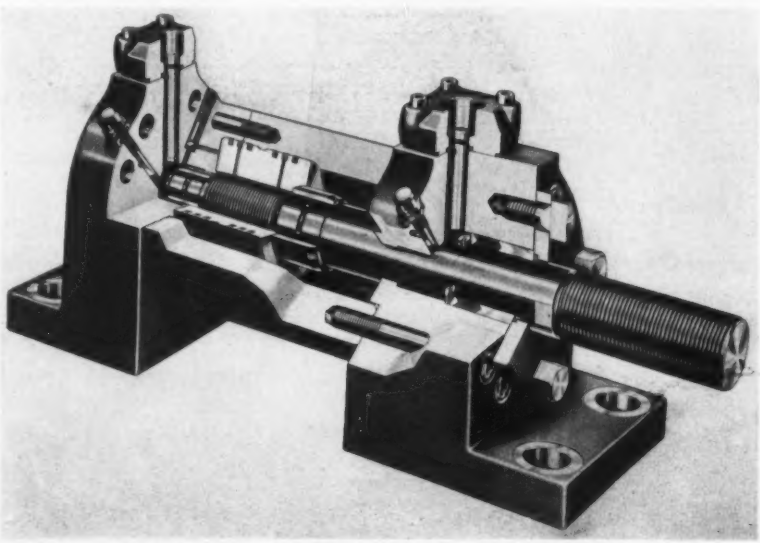
Cylinders are available with male or female, single or double end piston rods, and with or without cushion. Bore sizes in the standard cylinder line range from 1½ to 12 in., and the line includes models for use at 150 p.s.i. air or 300 p.s.i. oil, 2000 p.s.i. oil, and 3000 p.s.i. oil hydraulic.

Sprayer—Electrically heated, self-contained low temperature alloy metallizers, designed for close temperature and spray texture control, have been engineered by The Forrester Co., 895-29 Ave., San Francisco 14, Calif.

The sprayers have Nichrome heating elements and are equipped with sensitive temperature controls. Air requirements are 3½ cu. ft./min. at 35 to 75 p.s.i. The units can be used for intermittent or production spraying and, being constructed with an integral crucible, are said to achieve a close balance of thermal relationships between the thermostat, the heating elements, and the heated mass.

Model C-5 has 4-cu. in. crucible capacity and a range from 0 to 400° F.; model HL-7 has 12-cu. in. crucible capacity and a range from 0 to 600° F.

Metallizer—High-vacuum metallizing unit is designed to handle gold, silver, copper, and aluminum coatings on an interchangeable basis with equal efficiency. The unit overcomes many of the difficulties inherent in the use of metals other than aluminum in vacuum metallizing



Hydraulic Press Mfg. Co.'s new cylinder line includes 300-, 2000-, and 3000-p.s.i. models

Plan your future products with BAKELITE TRADE-MARK Polyethylene for better performance, economy, sales appeal

Now is the practical time to start planning with BAKELITE Polyethylene. The future—increased supply as a result of planned production expansion—comes closer every day.

When you consider this material in the light of product re-design, you will find a great many ways to take advantage of BAKELITE Polyethylene's unusual combination of advantageous properties.

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The many properties, plus examples of uses, are shown in our 24-page booklet, BAKELITE *Polyethylene*. Write for your free copy today to Dept. TU-13.

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TOP KICK

in vinyl plastics . . .

"FLEXOL"

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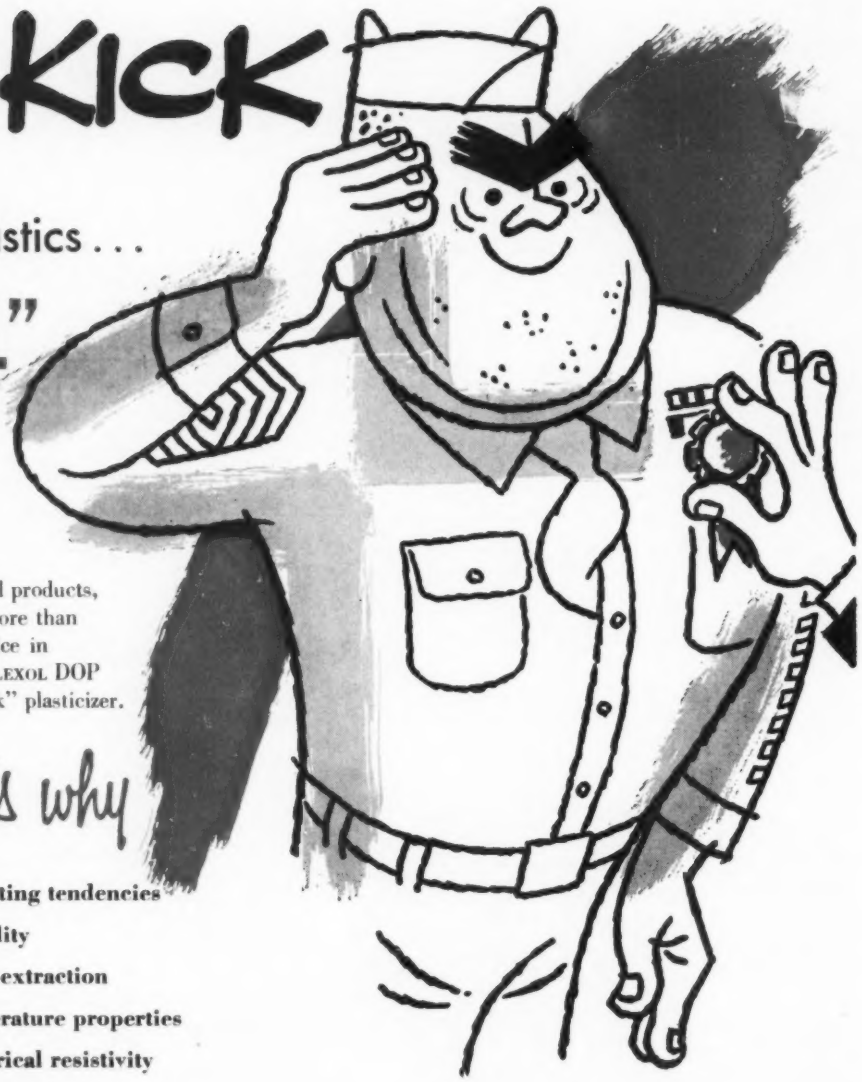
plasticizer

DOP



For your high quality vinyl products, choose the veteran with more than ten years of excellent service in the plastic industry . . . FLEXOL DOP . . . It's still the "Top Kick" plasticizer.

...and here's why

- **Low migrating tendencies**
- **Low volatility**
- **Low water extraction**
- **Low temperature properties**
- **High electrical resistivity**
- **High compatibility**

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Concerning properties, prices, and delivery of FLEXOL plasticizer DOP? Call or write any of our 21 offices located in principal cities. In Canada: Carbide and Carbon Chemicals, Limited, Toronto.

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Carbide and Carbon Chemicals Company
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.

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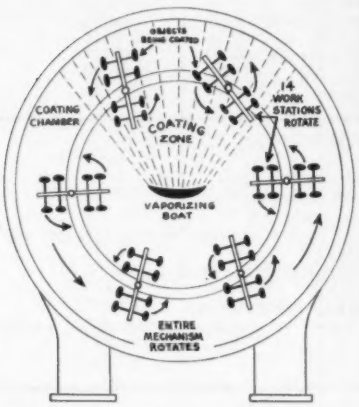
work. When using aluminum, the metal can be hung in clip form in a metallizing chamber from an ordinary resistance type filament. When heated, the aluminum will not drop off because, in its molten state, it "wets" the filament and clings to it. Mounted in the center of the chamber, aluminum disperses equally in all directions.

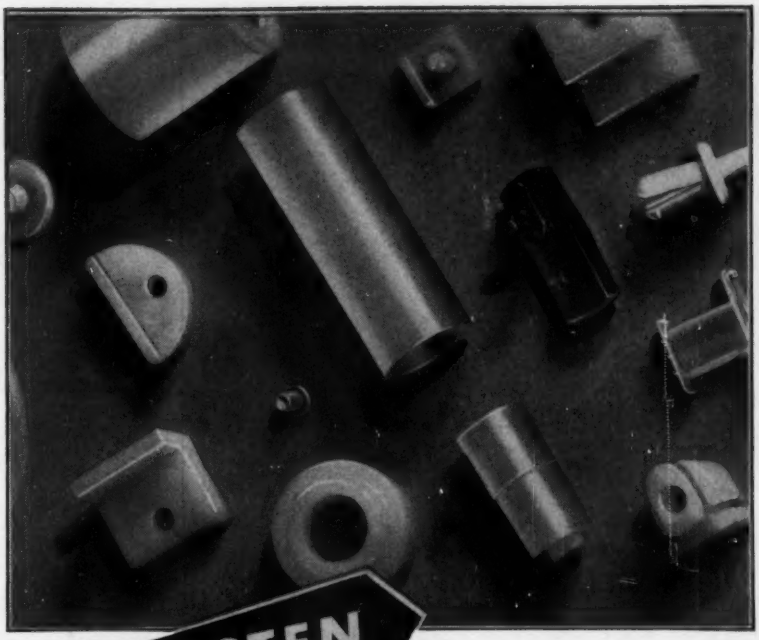
Gold, silver, and copper, on the other hand, do not have this "wetting" property and therefore tend to drop off the resistance elements. For that reason, these metals must be evaporated from molybdenum or



High Vacuum's metallizing unit can handle gold, silver, copper, and aluminum on an interchangeable basis

tantalum boats. When held in a boat, however, the evaporating metal can disperse only in an upward direction —necessitating a special chamber design to assure uniformity of coating.

In this unit, developed by High Vacuum Equipment Corp., Hingham, Mass., the metal to be evaporated is held in resistance-heated boats on stationary rods running through the axis of the chamber, and evaporates upward through an arc of 60 to 90 degrees. The pieces to be coated are placed on six riser rods, spaced equally apart along a circular, rotating mechanism inside the chamber and some distance from the evaporation boats. As the entire mechanism turns, each of the six work stations is successively passed through the arc of evaporating metal and the work is coated. To secure uniform and complete coverage of the work, each riser rod also rotates independently on its own axis. The interior mechanism is easily removable from the chamber.



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to what Top Engineers have to say about Nylon Moldings by SINKO

They are loud in their praise of Sinko Nylon Moldings; and a good many of them now associated with some of the country's leading manufacturers are consistently specifying Sinko Nylon for most of their molded parts. This is because Sinko Nylon has, among others, these highly desirable properties: Light Weight; Resilience; Toughness; Self-lubrication; Quiet Operation; Electrical Insulation; Resistance to Heat, Wear, and Abrasion.

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- Gears, Insulators
- Bearings, Washers
- Rivets, Screws
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- Rollers, Valve Seats
- Connectors
- Wearing Surfaces of All Types

SINKO molds all Thermoplastic Materials, including the remarkable new KEL-F . . . in sizes from 4 to 60 oz. A highly skilled staff of specialists, using the latest in modern equipment, will manufacture your injection molded parts and products with the utmost in accuracy, speed, and economy.

Our services include Design and Engineering; Mold Construction; Metal-Plastic Assemblies; 2 and 3 color Plastic Spraying and Painting; Hot Stamping; Vacuum Distillation Plating; Fabricating and Assembling.

Let us make test samples of your parts from Sinko NYLON or other Thermoplastic; or if you prefer, we'll send you the raw material.

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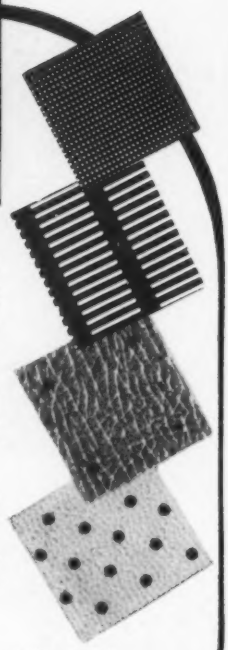
Specifications



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. . . plastic sheet or film, or plastic coated fabrics must permit the passage of air, sound or fluid, for ventilating upholstery covering, moving picture screens, filtering or other processes.

Then

. . . our perforating facilities are required and our 70 years of experience and specialized equipment can serve you well.

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Perforations ranging upward from 1/50" diameter to as large as wanted with infinite choice of spacing.

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In cast form this versatile thermoplastic offers decided advantages over extruded and molded rod.

- **superior machinability**
- **better thread retention**
- **easier bending and forming**
- **excellent light transmission**
- **transparents, pearls, and colors**

We also supply all thicknesses and colors of acrylic sheeting made of:

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PLASTIC GLASS CORPORATION
35 Avenue P Newark 5, N. J.
New York Phone: MUrray Hill 7-6477

Production of

FOR the purpose of this report, production is the sum of the quantities of materials produced for consumption in the producing plant, for transfer to other plants

PLASTICS AND SYNTHETIC RESIN PRODUCTION IN ... From Statistics Compiled

Materials
CELLULOSE PLASTICS:[a]
Cellulose acetate and mixed ester:
Sheets, under 0.003 gage
Sheets, 0.003 gage and over
All other sheets, rods, and tubes
Molding and extrusion materials
Nitrocellulose sheets, rods, and tubes
Other cellulose plastics
PHENOLIC AND OTHER TAR-ACID RESINS:
Molding materials[a]
Bonding and adhesive resins for—
Laminating (except plywood)
Coated and bonded abrasives
Friction materials (brake linings, clutch facings, and similar materials)
Thermal insulation (fiber glass, rock wool)
Plywood
All other bonding and adhesive uses
Protective-coating resins, unmodified and modified except by rosin
Resins for all other uses
UREA AND MELAMINE RESINS:
Textile-treating and textile-coating resins
Paper-treating and paper-coating resins
Bonding and adhesive resins for—
Plywood
All other bonding and adhesive uses, including laminating
Protective-coating resins, straight and modified
Resins for all other uses, including molding
STYRENE RESINS:
Molding materials[a]
Protective-coating resins, straight and modified
Resins for all other uses
VINYL AND VINYL COPOLYMER RESINS, total[b]
Polyvinyl chloride and copolymer resins (50 percent or more polyvinyl chloride) for—
Film (resin content)
Sheeting (resin content)
Molding and extrusion (resin content)
Textile and paper treating and coating (resin content)[c]
Flooring (resin content)
Protective coatings (resin content)
All other uses (resin content)
All other vinyl resins for—
Adhesives (resin content)
All other uses (resin content)
COUMARONE-INDENE AND PETROLEUM POLYMER RESINS
MISCELLANEOUS SYNTHETIC PLASTICS AND RESIN MATERIALS:
Molding materials[a,d]
Protective-coating resins[a]
Resins for all other uses[f]

* Dry basis is designated unless otherwise specified.
† Revised. ‡ Partially estimated.
[a] Includes fillers, plasticizers, and extenders. [b] Production statistics by uses are not representative, as end use may not be known at the time of manufacture. Therefore, only statistics on total production are given. [c] Includes

Plastics Materials

of the same company, and for sale. Sales include only the quantities involved in bona fide sales in which title passes to the purchaser.

POUNDS" FOR OCTOBER AND NOVEMBER 1953 by U. S. Tariff Commission

October		*November*	
Production	*Sales*	*Production*	*Sales*
1,916,529	1,787,488	1,513,195	1,678,007
1,204,556	1,235,640	1,062,622	889,721
543,281	540,294	422,936	382,271
7,477,955	7,333,558	5,802,855	6,027,907
649,941	575,283	633,101	509,943
441,119	504,311	401,407	437,124
19,556,598	17,481,948	17,616,857	15,093,209
†5,715,604	†3,607,155	‡5,403,268	‡3,198,639
862,156	899,311	605,105	631,727
937,358	1,145,322	931,794	985,295
†2,095,354	†2,220,834	‡2,162,609	‡2,370,399
†3,334,287	†3,179,832	‡2,971,774	‡2,563,559
†1,001,456	†1,049,466	‡1,184,721	‡1,208,931
†2,015,597	†1,709,344	‡1,369,916	‡1,453,373
†2,392,308	†1,852,785	‡1,584,443	‡1,521,171
†2,337,786	†2,509,603	‡2,798,967	‡2,773,020
†1,233,942	†1,579,091	‡1,549,970	‡1,620,009
†4,656,686	†4,892,564	‡4,594,619	‡4,098,017
†3,500,334	†3,475,568	‡3,071,934	‡3,066,057
†2,864,064	†2,163,929	‡2,697,826	‡2,002,829
5,906,150	6,099,645	5,950,475	5,781,478
†21,186,506	†24,386,530	‡19,343,802	‡22,097,742
†5,942,285	†5,713,391	‡7,245,635	‡6,466,046
7,530,462	†6,484,762	‡6,341,119	‡5,500,321
41,170,006	41,505,351	39,129,446	35,610,020
—	5,568,229	—	4,506,610
—	5,081,327	—	4,125,971
—	10,218,783	—	9,443,228
—	4,542,371	—	3,614,726
—	2,279,469	—	1,446,704
—	1,707,031	—	1,560,986
—	2,941,157	—	2,445,697
—	2,048,770	—	1,754,832
—	7,118,214	—	6,711,266
17,201,173	17,227,265	15,948,167	14,458,131
15,602,120	11,325,496	16,416,497	12,106,328
†763,582	†432,220	‡893,321	‡341,926
9,368,205	9,880,880	9,934,395	9,287,512

data for spreader and calendering-type resins. d Includes data for acrylic, polyethylene, nylon, and other molding materials. e Includes data for epichlorohydrin, acrylic, polyester, silicone, and other protective coating resins. f Includes data for acrylic, rosin modifications, nylon, silicone, and other plastics and resins for miscellaneous uses.

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Stamp Names, Trademarks, etc. right in your own shop with the *Precision Built* Kingsley Machine

Simple, easy to use. No skilled operators necessary.

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UP TO 1000 STAMPINGS PER HOUR

Uniform, clean-cut impressions in gold or any color.

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ALL MATERIALS — ALL METHODS

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- **Handwheel or motor controlled register units assuring accurate register at all speeds**
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- **Repeats in patterns from 14" to 72" and larger upon request**

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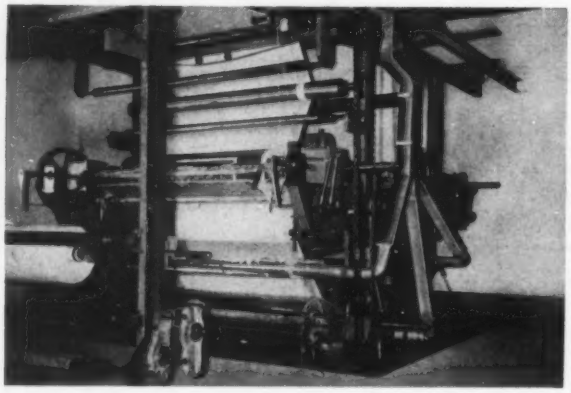

Ask about Lembo surface printing machines up to twelve colors.

LEMBO ***machine works, inc.***
248 East 17th St., Paterson 4, N.J.
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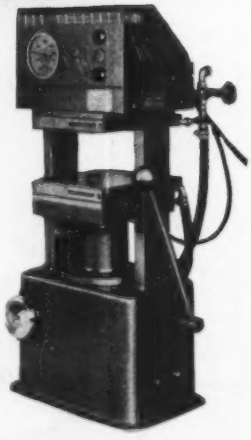
A new name
A better press

Formerly The PRECO

Now...The P·H·I



Compact • Dependable

- *accurate temperature and pressure controls*
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P-H-I Hydraulic Presses are used wherever specifications call for quick-acting pressure up to 40 tons and accurate temperature control to 600°F. May be operated individually by built-in hand pump, or in batteries from a central hydraulic system. *Write for detailed* circular.

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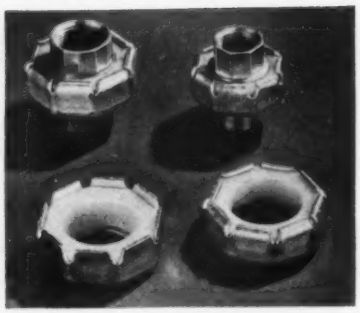

Pipe joints are electrically insulated by molded nylon threaded nut inserts

Nylon Nut Liners

ELECTROLYTIC corrosion, a serious cause of damage to gas distribution lines and water piping, results from contact between dissimilar materials and from stray electrical currents. As one solution to the problem, a special insulating meter nut has been designed, which consists of an outer steel shell fitted with a threaded liner molded of nylon. The nut, when used to join the pipe line with the gas or water meter, breaks the conductive circuit between the pipes and prevents the flow of current which, in its absence might electrolytically develop, thereby producing corrosive effects in the pipe joints. The rugged nylon liner also effects a mechanical joint which is dependable even at extremes of temperature.

The nylon liner, which is separately molded, is first snugly fitted into a steel shell with 8 extending fingers. A punch press, delivering about 80 tons of pressure, crimps the steel fingers over the liner. The molded-in opening in the center of the liner is then reamed to true tap drill diameter and tapped to the desired thread size.

In addition to the insulating meter nut, which joins meter swivel to meter proper, an insulating union, consisting of the meter nut with a short tail piece slipped into one end and a threaded piece screwed into the other is also available. A gas-resistant gasket separates the ends of the pipes in the union. Thread sizes up to 2 in. are currently being produced.

CREDITS: Nuts manufactured by Universal Controls Corp., Dallas, Texas, using nylon supplied by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

PLASTICS AID PLASTICS RESEARCH

Flexibility in the design of the new I.C.I. Plastics Division Research Laboratories has been achieved by the functional use of plastics materials, themselves derived from polymers produced by Plastics Division.

Inside the modern building, with its distinctive facade of 'Holoplast' laminated sheet filled with fibreglass, are some of the best-equipped laboratories in the world. Each laboratory floor designed on 4 ft. modular lines can be divided up and serviced on that basis by means of demountable hammered-finish 'Holoplast' panels, stove enamelled off-white. The floor is covered with p.v.c. tiles, and the benches are faced in blue 'Formica' with working tops of African mahogany veneered 'Holoplast'.

The service lines round the outside walls include drip waste pipes of 'Alkathene' brand polythene, while the unit flanged drainage pipes are of 'Darvic' rigid p.v.c. Flush-mounted diffusing covers on the lighting fittings are made from opal 'Perspex' acrylic sheet.

'ALKATHENE', 'DARVIC' & 'PERSPEX' *are registered trade marks the property of I.C.I.*

'FORMICA' *is the registered trade mark of Thomas de la Rue Limited*

'HOLOPLAST' *is the registered trade mark of Holoplast Limited*

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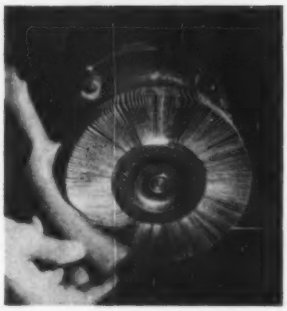
P.557

GRIND-O-FLEX

is a new, soft, flexible

ABRASIVE WHEEL

especially designed for finishing plastics



GRIND-O-FLEX

is the only abrasive wheel

that: Removes flash and parting lines on irregular shapes.

Gets in and around hard-to-reach areas.

Will not "flat" or dig into surfaces.

Hits selected areas to remove as much or as little stock as needed.

Does not heat up or scorch surfaces.

Will not load up, requires no skilled handling.

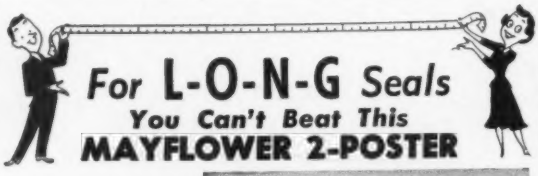
Offers a wide range of grits for all types of finishing work.

GRIND-O-FLEX is the ideal tool for removing excess material and for smoothing rough plastic surfaces. It consists of hundreds of "leaves" of abrasive cloth sealed to a core. As the wheel spins it presents a continuous abrasive surface to the work piece. The fanning action of the strips keeps it cool; absolutely no chance for scorched surfaces. The leaves wear down evenly at a uniform rate, presenting a fresh abrasive contact at all times.

GRIND-O-FLEX is flexible and gets around intricate shapes and into recesses with the ease of a buffing wheel. It can be used on selected, limited areas and easily controlled to remove only as much material as required without "flatting," gouging or marring surfaces. No skill or previous experience is necessary to get excellent results. The abrasive cloth does not "load up" when used on plastics.

GRIND-O-FLEX attaches to any rotating spindle (motor shafts, lathe, drill press, portable drill, flexible shaft), no special equipment to buy. Wheel is 1" wide by 6½" diameter and comes in a wide choice of grits. Arbors and flanges are furnished for mounting wheels to any shaft. For more informa- and prices, see your abrasive dealer or write

MERIT PRODUCTS, INC.
4023 IRVING PLACE, CULVER CITY, CALIF.



For L-O-N-G Seals

You Can't Beat This

MAYFLOWER 2-POSTER

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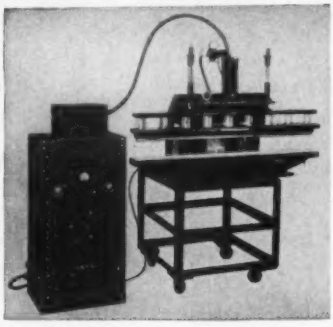

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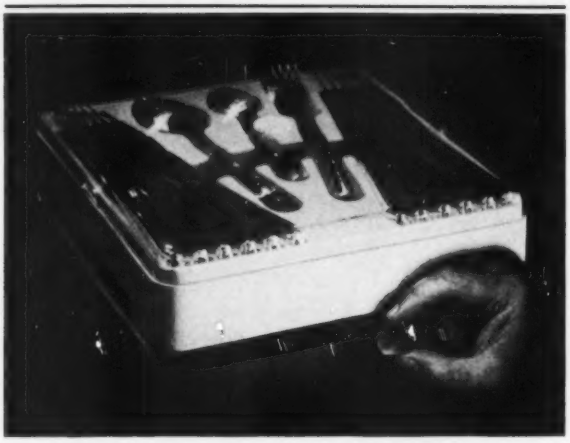


ONE Piece Per Pound . . . or 1,000 . . .

Maybe your job is fairly heavy . . . like the silver tray we're producing for Medco Products Company of New York. Or, maybe it has practically no weight at all, like the watch crystals we produce by the thousands. Or, maybe your job is in-between.

Whatever its weight, it's a job we'll do quickly, economically, and well.

CONNECTICUT PLASTIC PRODUCTS CO., INC.

70 West Liberty St. *Waterbury, Conn.*

Decanter Display

GIANT-SIZED replica of a whiskey decanter—designed to be used as a point-of-sale display—is vacuum formed from clear cellulose acetate butyrate sheet.

An authentic reproduction of the original decanter, the jumbo model is formed in two halves that are joined together to make the three-dimensional display.

In the production of the decanter, the heated butyrate sheet, 0.003 in. thick, is pulled by vacuum into a female metal die to form one complete half—including bottle and closure—of the decanter. Since the decanter is symmetrical, the same die is used for both halves. After a 1-min. cycle, the formed sheet is removed from the die and trimmed with a band saw.

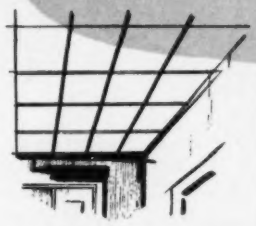
Each half of the decanter, with the exception of the closure, is then color sprayed from the inside to resemble a liquor filled bottle. The two halves are electronically sealed together and cemented to a wooden base. The paper label and the seal around the closure are also cemented on.

The completed decanter measures 26 in. high, 14½ in. wide, and 5 in. deep, yet weighs only about 5 pounds.

CREDITS: Display formed for Schenley Industries by Majestic Creations, Inc., Woodside, N. Y. on vacuum forming machine from Auto Vac Co., Fairfield, Conn. Cellulose acetate butyrate sheet supplied by Eastman Chemical Products, Inc.

Three-dimensional display, 26 in. high, is vacuum formed from butyrate sheet

USE PLEXIGLAS* ACRYLIC PLASTIC

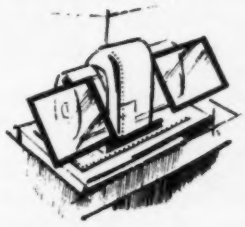


FOR LIGHTING

Highly efficient diffusion and transmission of light, color stability, and formability give PLEXIGLAS great usefulness as the diffusing element in wall-to-wall luminous ceilings and individual fixtures.

FOR SIGNS

Excellent appearance and legibility. Complete luminosity from interior lighting at night. Makes possible almost unlimited scope in sign design, from single custom installations to hundreds of dealer identification signs.



FOR SAFETY

Clear and breakage-resistant, PLEXIGLAS is widely used for machine safety shields, face guards, and industrial goggles. Combines clarity and safety with light weight.

PLEXIGLAS has many plus features that make it the 'IDEAL' material for your purposes. . . .

- STRENGTH
- WEATHER RESISTANCE
- CLARITY
- BEAUTY
- WORKABILITY
- LIGHT WEIGHT
- PERMANENCE

*Trademark Reg. Rohm & Haas Co.

Use INDUSTRY'S MAIN SOURCE FOR PLASTIC MATERIALS

Plexiglas
Lucite • Acetate
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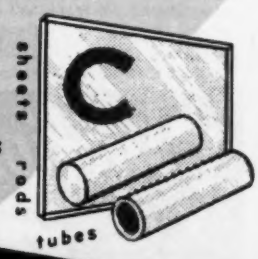

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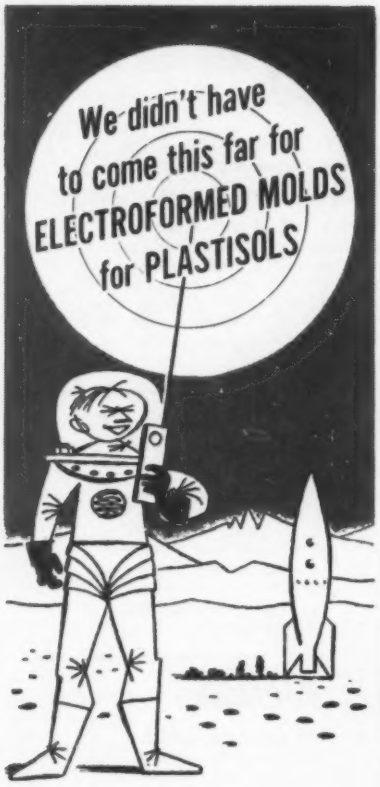

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And they'll be *precision*, close tolerance, "peas in a pod" molds; uniform in weight and dimensions to insure maximum uniformity in production.

Mold size is no obstacle, either. Our facilities are adapted to the accurate manufacture of even extremely intricate units. Moreover, your Plastiplate molds can be delivered to you complete with all necessary jigs and fixtures, ready for immediate use.

Ask for details today.

P. S. Remember too that Plastiplate is one of the country's largest and most experienced electroplaters of such small plastic pieces as buttons, beads, and novelties. Any metal finish, any color.

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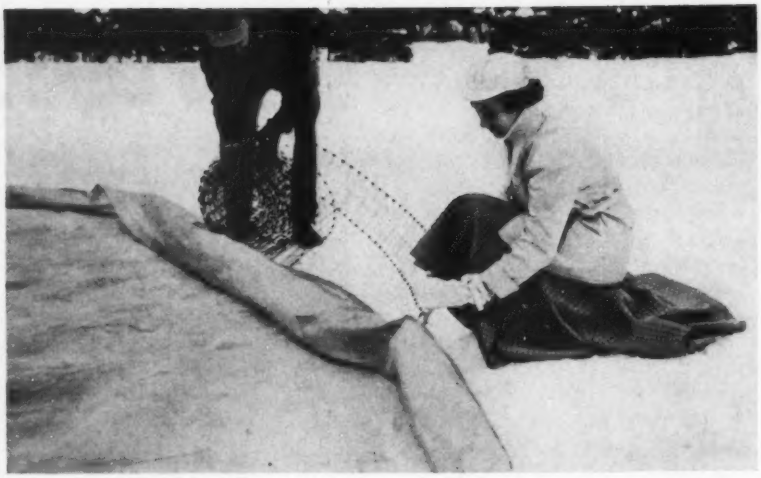


To set up portable ice skating rink, vinyl liner is unfolded and stretched over the ground. Wire fence is then pushed into ground around circumference of rink . . .

Ice Skating Rink From Vinyl Sheet

PORTABLE ice skating rinks, fabricated of tough vinyl sheet, quickly and easily convert backyards, gardens, or lawns into safe ice skating sites for the family or neighborhood.

The rink is available in several sizes, including a standard circular model, 24 ft. in diameter, which weighs only 60 pounds. The flexible rink can be set up ready for use in a few minutes. It is simply unfolded and stretched out on a reasonably level piece of ground. A metal wire fence, which is supplied with the vinyl sheet, is unrolled and pushed into the ground around the circumference of the rink. The flexible side walls of the vinyl liner are then draped over the fence and the completed rink is ready for filling with as little as 2 or 3 in. of water. Nature and cold weather do the rest. As soon as the water is frozen solid, the rink is ready for the skaters.

When warm weather sets in, the rink can be just as easily disassembled and folded into a compact package to be stored during the summer months.

CREDITS: The rink is made by Bilnor Corp., Brooklyn, N. Y., using Krene vinyl supplied by Bakelite Co., Div. Union Carbide and Carbon Corp., New York, N. Y.

. . . and side walls of the flexible liner are draped over it. Completed rink is then filled with water. With cold weather, family and neighborhood are soon iceborne

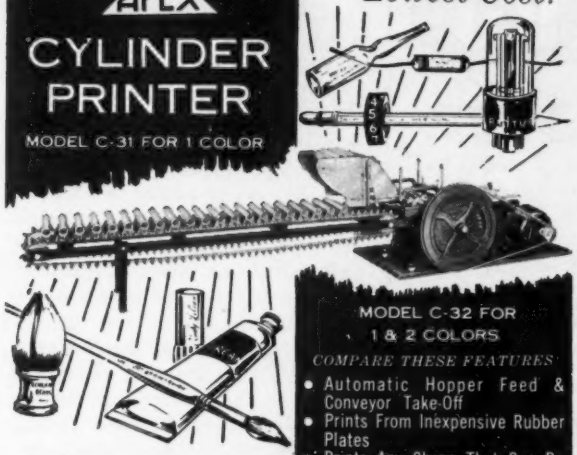
Photos courtesy Bakelite Co.

CYLINDRICAL PRINTING PERFECTION

. . . At Very Lowest Cost!

THE APEX CYLINDER PRINTER

MODEL C-31 FOR 1 COLOR



MODEL C-32 FOR 1 & 2 COLORS

COMPARE THESE FEATURES

- Automatic Hopper Feed & Conveyor Take-Off
- Prints From Inexpensive Rubber Plates
- Prints Any Shape That Can Be Rolled Such As A Hexagon, Pentagon, Etc.
- Prints One Or More Lines At The Same Time On A Portion Of, Or Completely Around Tube
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For high speed decorating, piece-marking or trade marking on plastic, wood, metal, cardboard, etc. Also models for flat or irregular shapes. 45 standard models to choose from. Write for details.

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Manufacturers of 30 Ton Automatic Compression Molding Machines with Minimum Lost Cycle Time.

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PRODUCTION MACHINERY . . . SINCE 1867

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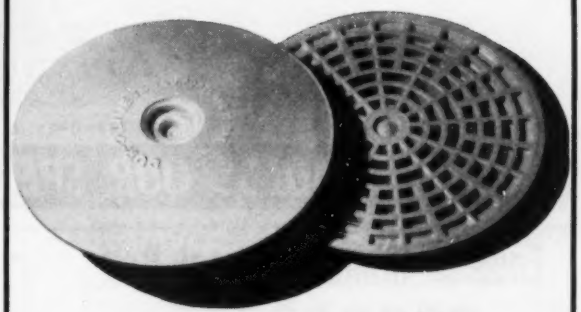
to all

molders!



. . . this traffic lane marker is covered by U. S.

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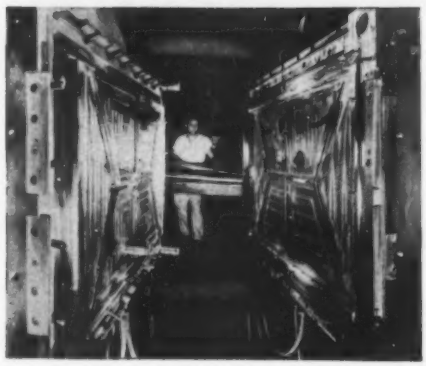
PLASTIC MOLDS



Our new modern factory is completely equipped with machinery and handling facilities for the best in mold design and construction from the smallest to the largest of molds.

WE SUPPLY COMPLETE FACILITIES IN DESIGN AND CONSTRUCTION OF INJECTION, COMPRESSION, TRANSFER, PLUNGER AND LOW PRESSURE MATCHED MOLD APPLICATIONS.

SINCE 1918

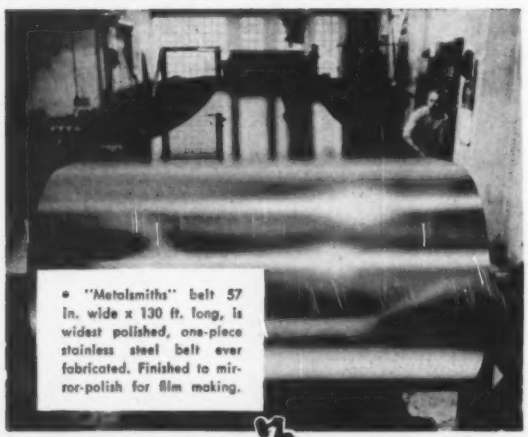
Typical of large molds recently produced is the one pictured above. Mold weighed 20,000 lbs.

EAGLE
TOOL AND MACHINE CO.
EVANS TERMINAL ROAD, HILLSIDE, N. J.
TELEPHONES: ELIZABETH 4-1515-16

• LARGE MOLDS OUR SPECIALTY •

Endless Stainless Steel Belt PROCESSES AS IT CONVEYS!

- Produces automatic contact-gloss
- Improves setting
- Speeds cooling and conditioning



- One piece—polished or unpolished
- Widths to 60 inches —length unlimited —no center seam

• "Metalsmiths" belt 57 in. wide x 130 ft. long, is widest polished, one-piece stainless steel belt ever fabricated. Finished to mirror-polish for film making.

Investigate this "belt-processing" method of obtaining a smooth, gloss finish on plastics, film, foam rubber, latex, resins, leather, compounds and coatings.

"Metalsmiths" Stainless Steel (18-8) Endless Belts furnish a dense, corrosion-free, highly-polished surface that imparts its gloss on contact with the product it conveys. All welds finished to belt thickness.

Consult our engineering department on possibilities for your products, without obligation.

METALSMITHS, Div. of Orange Roller Bearing Co., Inc. 558 White St., Orange, N. J.

METALSMITHS
STAINLESS STEEL
ENDLESS CONVEYOR BELTS

Cable Harness

THE electrical nerve system of a beverage-dispensing machine is insulated and protected by a versatile combination of vinyl, phenolic, and polyethylene parts.

Two separate control circuits comprise the heart of this electrical system. The first is the selector relay circuit incorporating two Micro-switches that relay the customer's choice of beverage to the proper syrup-dispensing pump. The second is the control harness which operates the cup stack. Four Micro-switches are used in this harness. The first rotates the stack of cups as they are used, another Micro-switch stops the cup stack when it has rotated 360 degrees, a third limits the amount of liquid dispensed, and a fourth switches off the machine when all the cups originally stored in it have been used up.

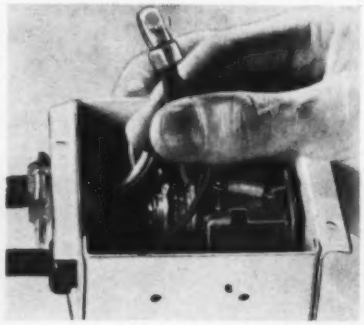
In both the selector relay circuit and the control harness, all cables are insulated and jacketed with vinyl. Pressure-sensitive tape with a vinyl film backing holds the cables together in desired combinations.

Both circuits also use housings molded of rugged phenolic to guard the sensitive Micro-switches in both circuits.

Finally, a three-conductor splice in the selector circuit is insulated with a tight-fitting cap molded of polyethylene; two five-conductor splices in the control harness are insulated with caps and small, removable lock-rings, both also molded of flexible polyethylene.

CREDITS: Control circuits produced by American Electric Cable Co., Holyoke, Mass., using vinyl, phenolic, and polyethylene supplied by Bakelite Co.

Three-conductor splice is insulated with tight-fitting polyethylene cap



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. . . is changing all established concepts of economy, speed and safety of operation among plastics molders. This revolutionary new machine will plasticize 60 pounds of polystyrene per hour and can mold large projected area parts weighing more than 7 ounces at the rate of 2½ per minute. Injection pressures up to 15,000 psi . . . compensating feed mechanism . . . automatic molding cycle . . . large platens . . . finger-tip controls . . . fast opening die-lock mechanism and minimum maintenance make the LEWIS "6" outstanding for low-cost high-speed production molding. Intricate parts formerly made on much larger machines now can be produced on Model "6" at a fraction of initial and normal operating costs. The LEWIS "6" also features the exclusive new "Hydra-Lock" clamp . . . the safest, most powerful mold clamping device available today. "Hydra-Lock" develops a 200-ton clamping pressure in tenths of a second . . . facilitates quicker, easier mold setting procedures.

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Chemical Kit

SUITCASE-TYPE container is formed of styrene copolymer sheet to hold a large number of small items securely in place and still permit them to be readily accessible. Although specifically designed to accommodate the glass bottles, test tubes, and other accessories of a Chemical Analyzer Kit, the packaging principles involved in the construction of the case are adaptable to other applications as well.

Previous to the introduction of the formed plastics case, the kit was housed in a sheet metal unit which was awkward in size, heavy, and unsatisfactory for holding parts securely in place. In addition, the size and shape of the metal case required that half the contents be placed on a metal tray which covered the other half, making the lower half inaccessible.

Formed copolymer case keeps contents securely in place yet easily accessible

By replacing metal with plastics, all these disadvantages were overcome. The new housing is formed of tough copolymer sheet with molded-in ribs to give additional shock resistance. To eliminate the double tier construction, a pair of liners, formed from copolymer sheet with recesses for bottles and other items, are cemented one to each half of the case. When the case is open, one liner acts as a retainer for the contents; when closed, the corresponding recesses in the other liner provide a snug fit for the packaged units in the kit.

Fully loaded, the new case, which measures 26¾ by 12¾ by 4½ in., weighs ⅓ as much as the old one.

CREDITS: Case made by Bassons Industries Corp., New York, N. Y.; sheet supplied by U. S. Rubber Co. and Bolta Products Sales, Inc.

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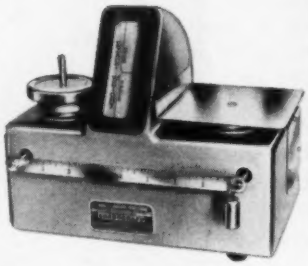

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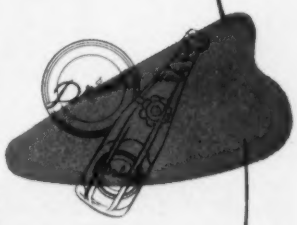

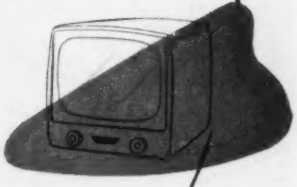

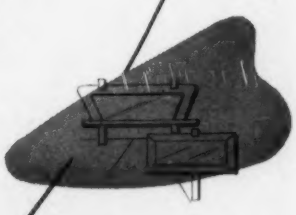

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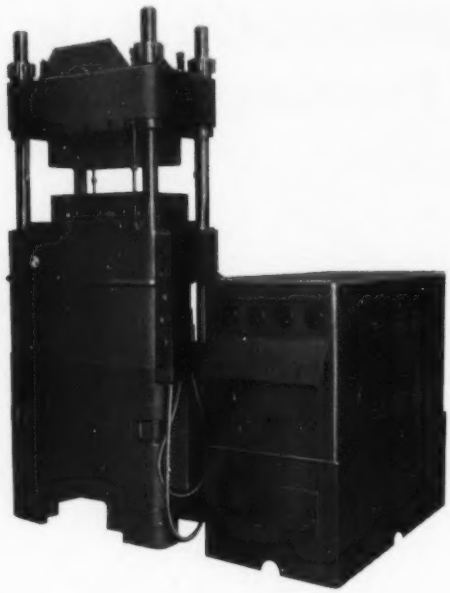

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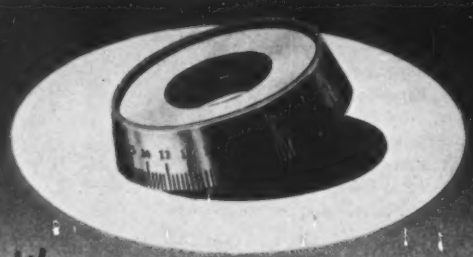

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Glass-Polyester Dome for Phone Booth

One-piece roof on telephone booth is molded of glass-reinforced polyester

AMONG the newest applications of reinforced plastics is a translucent fibrous glass-polyester roof—called Glo-Dome—designed to fit all standard 30- by 30-in. indoor and outdoor telephone booths. According to tests made by several telephone companies, installation of the plastics dome in place of the conventional roof has resulted in a marked increase in the public's use of booth service and has brought about an appreciable reduction in lighting and maintenance costs.

The translucent roof, through which passes the illumination from the interior of the booth, not only provides high night-time visibility and identification (thereby attracting impulse callers), but also eliminates the necessity for exterior lights and fixtures—an advantage which, according to the manufacturer of the unit, can cut booth lighting cost by as much as 90 percent.

Molded in one piece, the Glo-Dome is constructed to drain rain water to the corners and to eliminate back and side overhangs, permitting flush-banked group installations of booths. A translucent, perforated breather section under the front overhang improves air circulation in the booth.

Weight of the roof is 11½ lb., making one-man installation feasible. It is leakproof and will not corrode, decay, warp, or dent. Its integral white pigmentation eliminates the need for refinishing.

In production of the unit, a preform is produced on a rotating vacuum table. Completed preforms are then molded in matched metal dies on a low-pressure combination air-hydraulic press, especially designed without platens for this operation. Production time for each dome is 8 min.—two on the preforming table and six in the press. Lettering is silk screened.

CREDITS: Glo-Dome designed by Robert Smith Fitch & Associates and molded by Gladwin Plastics Inc., Atlanta, Ga. on low-pressure press designed by Gladwin Plastics and built by Davidson Kennedy Co., Atlanta. Laminac polyester resin supplied by American Cyanamid Co.

Booth dome is preformed on vacuum-equipped table prior to molding

Photos courtesy American Cyanamid Co.

Finished molding is removed from low-pressure air-hydraulic press

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PROPER APPLICATION...PRODUCT IMPROVEMENT

Courtesy Naugatuck Chemical Div., U.S. Rubber Co.

Insulated door of reinforced plastics is lighter than wood-metal counterpart

Plastics Doors

RUGGED reinforced plastics doors that will save hundreds of pounds of dead weight and will not freeze closed have been developed for use in insulated trucks.

The new doors are molded in a single pan-like section that is then filled with insulation and faced with a sheet of aluminum. A large door of this construction weighs 55 lb.—about one third the weight of a comparable conventional insulated door made up of wood and metal.

Because the low water absorption of reinforced plastics prevents swelling or shrinking, the new doors, when installed in a molded reinforced plastics frame, require only 1/16 in. clearance—less than half the usual clearance for conventional insulated doors. As a result, the moisture build-up around the edges of the door, and the consequent accumulation of ice, is minimized. The insulation qualities of reinforced plastics and its smooth molded surface, on which ice cannot easily grip, also help prevent the door from freezing fast to the frame.

The easy-to-clean doors are impregnated with white pigment for sanitary reasons and are available in several sizes.

CREDITS: Doors designed by Weber Industries, Long Island City, N. Y. They are made by American Enterprises, Stamford, Conn., using fibrous glass supplied by Owens-Corning Fiberglas Corp. and Vibrin polyester resins produced by Naugatuck Chemical Div., United States Rubber Co.

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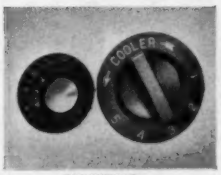

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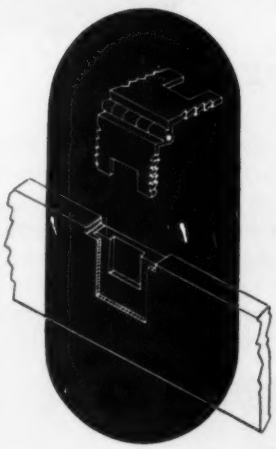

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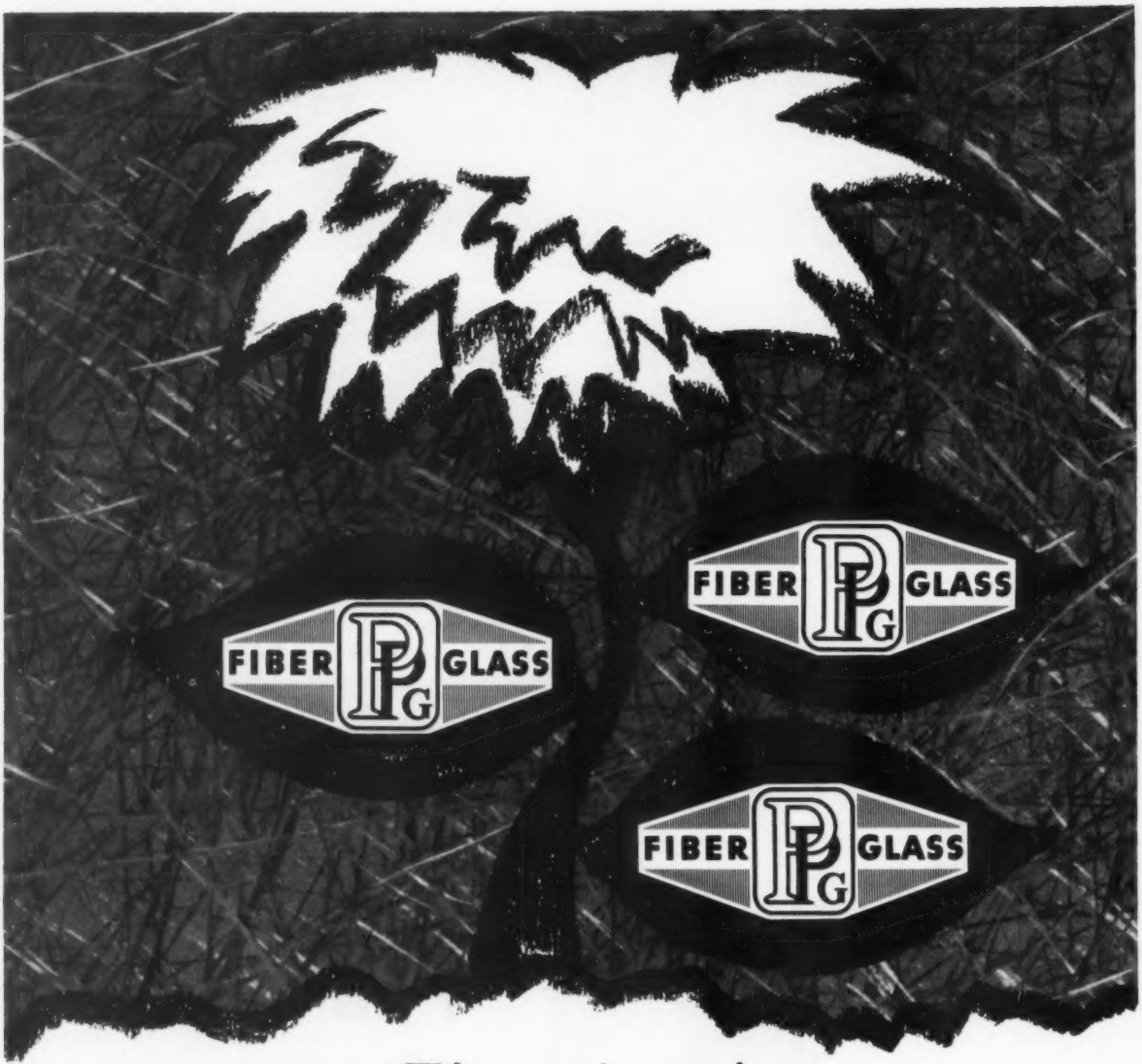

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Shoe Cleats

LIGHTWEIGHT football cleats that won't crack or burr are now being molded of nylon.

The tough, resilient nylon cleat was designed to replace conventional cleats which are molded of hard rubber or machined from aluminum bar stock. Although offered at a price competitive with conventional cleats, the new model offers many extra advantages. It is one-third the weight of a metal cleat and, because of its smooth finish, prevents mud from clinging to the players' shoes. This makes for a speedier game on muddy fields and eliminates the need for longer, more dangerous mud cleats on the football field.

The cleats are injection molded in a 10-cavity mold. In the center of each cleat, a hole with a tapered lead is molded in. When mounting the cleat, a motorized wrench is used to force the cleat onto the stud of the shoe. Once applied, the self-tapping, self-locking cleats cling so firmly to the stud that a special core wrench is needed to pry them loose. The fact that the nylon cleats will remain so firmly fixed in place provides an extra margin of safety for participants in America's most popular fall sport.

CREDITS: Nylon football cleats are distributed by F. C. Phillips, Inc., Stoughton, Mass. They are molded by Bourget, Inc., Brockton, Mass., on a Fellows machine. FM-10001 natural nylon is supplied by E. I. du Pont de Nemours & Co., Inc.

Tough, resilient cleats (insert) for football shoes are molded of nylon

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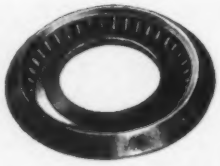
VINYL PLASTISOLS



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Compression molded thermoplastic sheet users now have available larger sizes of Acadia polyethylene. These are available in the new size of 36" x 36" x 1/16". Standard sizes are furnished in 20" x 20" from 1/32" to 1" thick and 24" x 24" from 1/16" to 1/2" thick. Special sizes are also available. Polyethylene, Polystyrene, Tenite, Saran, Vinylite, Geon, Ethyl-Cellulose, Styralay, and Nylon sheets can be compression molded in most of the above sizes. Wire or write for specifications.

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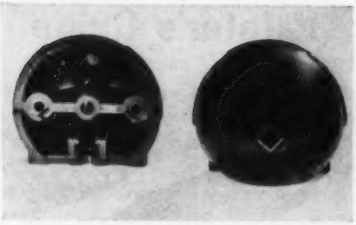

Two-piece base is joined together by a single bolt through center of unit

Antenna Base

NEW indoor television antenna consists of two 3-section telescoping elements set into a ball-shaped base which is molded of phenolic.

The rugged base is compression molded in two almost identical hemispherical halves. To join the two pieces into one unit, a single bolt is run through a central cored boss molded-into each of the halves of the base.

The assembled base, which is dark mahogany in color, is then set into a low, heavy metal casting that provides greater stability to the antenna. No matter how far apart the two telescoping elements are positioned, the antenna will not tip over.

A single knob used for sharper tuning of individual channels is installed on top of one half of the base and a 5 ft.-length of twin lead wire insulated with polyethylene is run through the base and attached to the two elements.

CREDITS: Base is molded for Radio Merchandise Sales, Inc., New York, N. Y., by Kuhn & Jacob Molding & Tool Co., Trenton, N. J. Polyethylene and phenolic supplied by Bakelite Co., Div. Union Carbide and Carbon Corp.

Knob set into molded phenolic base of antenna is used for sharp tuning

Courtesy Bakelite Co.

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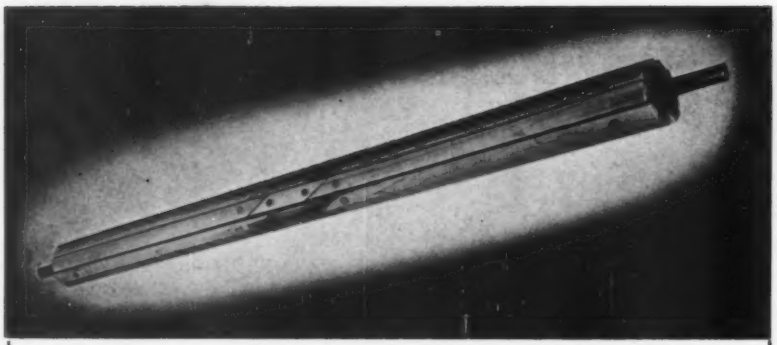

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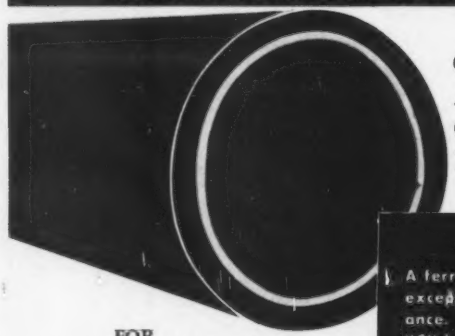

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CREDITS: Painter's Handy-Guide molded by Como Plastics, Inc., Columbus, Ind., for Thoss Mfg. Co., North Manchester, Ind. Tenite II cellulose acetate butyrate supplied by Eastman Chemical Products, Inc.

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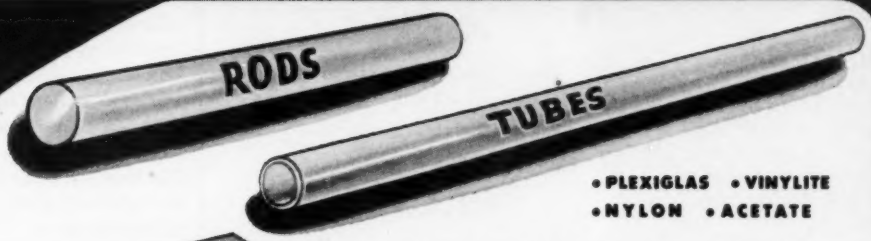

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S.P.E. Officers

DESPITE a raging blizzard, the worst experienced in Toronto, Canada, in the past two years, over 1150 registrations were counted at the 10th Annual Conference of The Society of Plastics Engineers, Inc., held Jan. 27, 28, and 29 at the Royal York Hotel in that city. This attendance is by far the highest which has ever been recorded for an S.P.E. meeting. During the session, over 70 new members were enrolled.

New national officers were elected for 1954 as follows: president, John W. LaBelle, of Foster Grant Co.; vice president, Don F. Hoffman, of Evans-Winter-Hebb, Inc.; treasurer, John W. Mallory, of The Parker Stamp Works, Inc.; secretary, Frank W. Reinhart, of the National Bureau of Standards.

The following council members from the local sections participated in the election:

H. S. Nathan, of Atlas Plastics, Inc., Buffalo Section; W. F. Oelman, of Standard Molding Corp., Miami Valley Section; Dan Otto, of Plastic Parts & Sales Co., St. Louis Section; Wayne I. Pribble, of Barrier-Pribble & Co., Inc., Northern Indiana Section; J. Robert Johnson, of Monsanto Chemical Co., Rhode Island-South Eastern Massachusetts Section; Arthur A. Allen, Jr., of Bakelite Co. of Canada, Ltd., Quebec Section; Charles L. Seay, of Eastman Chemical Products, Inc., Ontario Section; L. J. Swift, of Jarrow Products, Chicago Section; Joseph B. Schmidt, of Koppers Co., Inc., Pittsburgh Section; John Chomicz, of General Electric Co., South Eastern Ohio Section; Gerard V. Delaire, of Eastman Kodak Co., Rochester Section; E. P. Moslo, of Moslo Machinery Co., Cleveland-Akron Section; Lewis J. Pentland, of Durez Plastics & Chemicals, Inc., Connecticut Section; Jerome Formo, of Minneapolis-Honeywell Regulator Co., Upper Midwest Section; R. L. Dunham, of Owens-Illinois Glass Co., Toledo Section; R. B. Bishop, of Socony-Vacuum Oil Co., Inc., Philadelphia Section; Don F. Hoffman, of Evans-Winter-Hebb, Inc., Detroit Section; Frank W. Reinhart, of the National Bureau of Standards, Baltimore - Washington Section; John W. LaBelle, of Foster Grant Co., Eastern New England Section.

Plastics Pipe

(*Continued from p. 81*)

100,000 ft. in California for transportation of natural gas by a utilities company. That project and other uses were discussed in MODERN PLASTICS in an article, "Butyrate Burrows Ahead," on page 202, May 1953. Various other utilities companies are carrying out similar projects. Apparently butyrate pipe has found favor because of ease of installation and its anti-corrosive property in acid soils. It is easily joined by solvent welding with slip-on sleeves, and butyrate molded fittings can be readily attached. The American Gas Assn. devoted an entire session of its last annual meeting to a discussion of handling thermoplastics pipe, especially butyrate. The wonder is that even more has not been used for this purpose since it has been satisfactory so far in practically all natural gas carrying installations where it has been tried either as a lead-in pipe from the main to house or as a flexible tube to insert in old iron casings when repairs or alterations have to be made.

Change Takes Time

Butyrate pipe is not recommended for artificial gas or in ground that is unusually rocky. Perhaps one reason it has not been more rapidly adopted by utilities is that they are notoriously slow in making changes and want many years of successful experience before a change-over can be carried out. It would seem that the 8-year trial in California and several others in lesser magnitude should be sufficient test, but each company wants to make its own. No one seems willing to make an estimate on the potential volume of gas pipe that could be placed in butyrate, but it must be several million feet.

Farm water pipe has gone mostly to polyethylene, clay, concrete, and aluminum and other metals. Butyrate is a little more costly for these purposes. Moreover, it tends toward brittleness at low temperatures and is therefore seldom used in exposed positions in northern United States or Canada. But even metal pipe is generally buried several feet deep when used in such climates in order to protect its contents.

Butyrate pipe is used in various cold water applications in several

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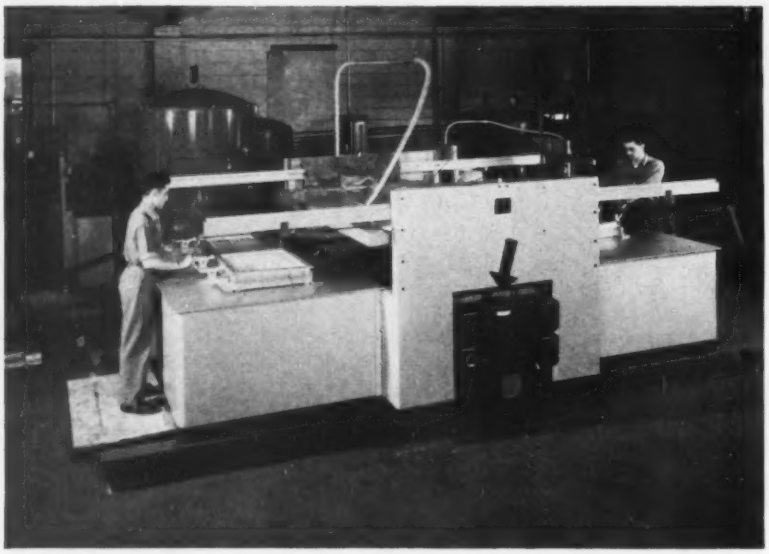

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manufacturing plants, where its transparency and anti-corrosive properties are of particular value. It is known to have been used for water lines in sugar mills and just recently hundreds of feet of 3-in. butyrate pipe were installed by a public utility power company in Carolina to transport the company's water supply from wells to the plant.

Another unusual use for butyrate pipe that stems from its strength and transparency is in conveyor lines in Dixie Cup manufacturing plants. Pipe for that job is delivered in 20-ft. lengths, in sizes from 1⅞ to 4¾ in. inner diameter, and with fittings that permit 30-, 60-, and 90-degree bends.

Biggest Potential

The biggest potential for butyrate (and, indeed, for all rigid thermoplastics) pipe could be in the oil fields where sour crudes, paraffin, and brine are problems. Paraffin deposits make necessary frequent and expensive cleaning. Sour crude oil and salt water corrode metal pipe rapidly. Not all petroleum fields are bothered with these problems but wherever they are encountered, butyrate pipe is an economical answer.

There are many claims and counter-claims concerning the satisfaction of users with butyrate pipe for this purpose, but one pipe maker at least has pretty powerful evidence of butyrate's successful application for this purpose. A letter from a customer points out that he saved $30 a month per well in the winter time because he didn't have to clean paraffin out of the butyrate pipe with steam. The transparent pipe provides a visual means of determining a well's production characteristics, cuts maintenance costs, reduces shut-downs to a minimum, and solves the highly troublesome paraffin problems.

Another successful installation of butyrate pipe is a 9-mile cross-country pipeline near Poplar, Mont. The pipe used is 3-in. I.D. with a wall thickness of 0.125 inches. It is designed to operate at a maximum pressure of 90 p.s.i. at 60° F. and will deliver 2500 barrels of crude oil per day. It is estimated that the percentage of increase of flow through the butyrate pipe as compared with steel may run as high as 40%, representing a considerable savings in the cost of electric power for pumping. Installation of the pipeline was

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made with a crew of three workmen, using slip-sleeve couplings and solvent cement. They completed the job in five days. Their speed was due largely to ease of handling the lightweight plastics pipe, which weighs 13 lb. per 20-ft. section compared to 153 lb. for steel.

The gathering lines where crude oil is carried from well to separators or settling tanks, storage tanks, and loading racks is the spot where almost every plastics pipe, including resin-fibrous glass, is being tried most enthusiastically. Estimators think that about 50,000 miles of such pipe is in existence but that only about 20,000 miles operate in sour oil areas. It is these tremendous figures that have aroused plastics pipe producers, for it can be seen that replacement volume would amount to millions of feet annually.

Butyrate pipe seems to have been the type most widely tested for this purpose up to date. More and more of it is shipped to the oil fields every week, and performance is obviously good. There are, however, some complaints, one of the loudest of which is simply the workmen's gripe that there are already too many kinds and sizes of pipe in the field. Steps must be taken to get the workmen plugging "for" rather than "against" plastics pipe. Many a foot of butyrate pipe has been sold in manufacturing plants when the workman was shown how it would help him.

Pressure is another bugaboo, yet butyrate is considered to be strong enough at normal temperatures for a good part of the oil field installations. Care must be taken to see that plastics pipe is not used where pressure is too great. Several reported failures happened where the pipe was perfectly acceptable for normal pressure, but where someone tightened a valve—pressure built up and pop! went the pipe.

RIGID VINYL

Rigid vinyl pipe is still a comparative stranger in the United States, except in chemical plants where it is beginning to make good headway because of chemical resistance and good strength. Just as this article goes to press, there comes to hand a notice that a new 3000-ft. installation has been placed in a chemical plant in the Detroit area. Still another recent vinyl pipe application is

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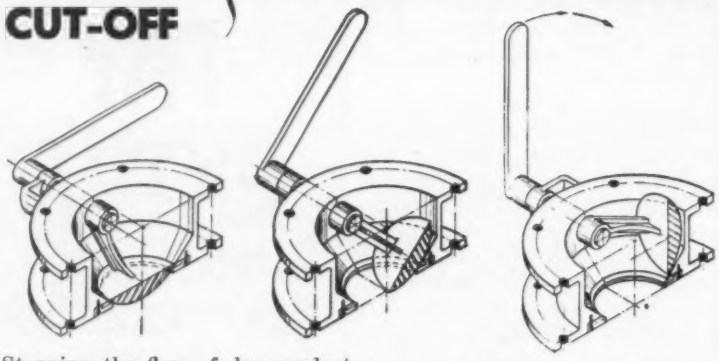

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Volume of production of rigid vinyl pipe is practically impossible to estimate, but it is difficult to account for even as much as a million pounds in 1953. Yet despite this comparatively small output today, there are many plastics authorities willing to predict that rigid vinyl pipe will become as large in volume as any other plastics pipe within 5 to 8 years.

It is a potential competitor for most any outlet where other kinds of plastics pipe are used. It is exceptionally good for outdoor use because of its weathering properties. There are several reasons for its slowness to develop in this country. One is its comparatively high cost. Almost everyone believes that cost will come down soon, but when and how much is unknown. Strictly rigid vinyl compounds are in the 50 and 60¢ ranges, but extruders are beginning to find that they can use some of the elastomeric compounds for rigid pipe with satisfactory results. These latter compounds are in the high 40¢ range.

Another reason for slowness in growth of rigid vinyl products is that elastomeric-type vinyls have been comparatively scarce ever since the war until the last year or so. Consequently, developmental work in rigid vinyl was put off until more time and material were available.

Easily Handled

Pipe makers have found that rigid vinyl can be handled just as easily as elastomeric vinyl, provided that the need for accurate heat control is emphasized. With proper controls, it is not unusual to extrude non-plasticized rigid vinyl chloride at an extruder barrel temperature of 400° F. and stock temperature of 390° F. Extrusion at the upper limit of the operating temperature range for vinyl chloride will always give the best results.

It is possible that rigid vinyls may also be improved to withstand higher heat distortion temperatures than the present limit of 170° F. When and if raw material suppliers succeed in raising this temperature, rigid vinyls will certainly have a much broader field in which to operate. One of the most interesting is in the plumbing field for hot water

lines. Vinyls in cold water lines are already quite satisfactory.

Molding of pipe fittings from rigid vinyl chloride has been the biggest stumbling block to more rapid adaptation of vinyl pipe, but that situation is rapidly being remedied.

The wine, dairy, mining, and other processing industries have had vinyl tubing or pipe on test for some time, but no decision has been given on performance as yet. Such laudable caution helps further to explain the delay in accepting plastics pipe for many applications.

The vinyl pipe people are conscious of the fact that they must service an industry that sets up exact specifications and won't permit the wide tolerances allowed in such things as textiles. They know that if material for pipe is loaded, it must be specified as such. The lesson of an inferior grade of pipe that was sold to do a job in the oil fields for which it was not suited and which burst when pressure was applied has not been forgotten. That burst was a hard set-back for vinyl in the oil fields and pipe makers are hoping no more vinyl pipe is tried there until the producer knows what his product is expected to do and builds his product to those specifications.

Oil and Water

With these thoughts in mind, the vinyl pipe makers have their eye on the oil fields where they say 1000 miles of all kinds of 2-in. pipe and 3000 miles of 4-in. pipe will be laid for crude-oil gathering lines in 1954. Two-in. rigid vinyl pipe weighs 3600 lb. per mile, while 4-in. P.V.C. pipe weighs 10,500 lb. per mile. Vinyl pipe makers don't expect to get much of that mileage in 1954, but maybe in another year they will be ready to really go after it. Vinyl people insist that 2-in. vinyl pipe for this market can be sold for 68¢ a linear ft. and will compete with iron pipe at between 30 and 40¢ a linear ft. because it will last so much longer.

One brand new installation in the oil fields is 33 miles of rigid vinyl pipe laid in Kansas to carry salt water from petroleum separators. An interesting feature of this job is that the pipe was laid and joined with a solvent adhesive on a day when the temperature was 16° F., yet no trouble was encountered as a result of the frigid atmosphere.

The vinyl folks also have their

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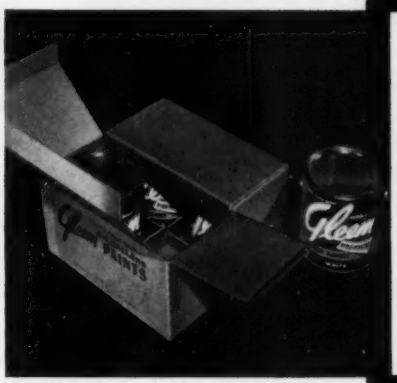

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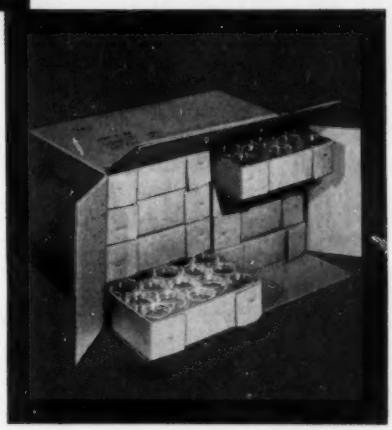

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eye on the various irrigation and other water supply pipes and assert that a rigid vinyl 1-in. pipe will eventually be made at a price to compete with anything else in this field, including aluminum, which was mentioned earlier in this article.

Vinyl Abroad

One of the oddities in the vinyl pipe situation is that although the pipe is slow to take hold in the United States, it is really old stuff in Germany, where 18-yr. old installations in chemical plants are still in service. In West Germany, 1½ million lb. of rigid vinyl were used for pipe in 1951. France used 1 million lb. and Switzerland consumed 250,000 pounds. But even those comparatively large amounts were confined almost exclusively to chemical plants, and the market was so good that no attempt was made to place the pipe in other types of lines.

The newest item made from hard P.V.C. in Europe is aluminum pipe lined with vinyl to permit the use of piping in high-pressure systems, but the maximum temperature limitation is still 150° F. Stainless steel pipe and fittings cost twice as much as similar P.V.C. applications in Europe.

The largest diameter tube that is normally extruded with a minimum amount of plasticizer is 8 in.; this work is being done in France and Germany. Larger sizes require 5 to 8% plasticizer. Practically all P.V.C. pipe in Europe is joined by solvent welding or with flanges.

If the present tendency for improvement of technique continues, vinyl pipe makers are expecting to produce many products not even mentioned by other plastics pipe producers. They point to such possibilities as colored pipe or tubes for furniture, ladder steps, storm window frames, gutters, and downspouts. They might not all be called pipe, but they are extrusions and a pipe producer could handle them.

Fittings

Fittings for plastics pipes pose troublesome problems at times. Butyrate can be solvent welded with telescope-type fittings. Polyethylene and styrene type pipe can be joined with high-impact styrene fittings. Rigid vinyl can be solvent welded and molded vinyl fittings are being made. Fibrous glass pipe presents

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quite a problem at joints and fixture ends, but an epoxy resin adhesive is offered as a solution.

A recently patented fitting may be helpful in solving some of these problems. It is a fixture with tubular, tapered walls so constructed that the cement or solvent will not rub off when the pipe is inserted into the pipe fitting. It is designed for use with either thermoplastic or fibrous glass pipe.

Perhaps the main problem is joining plastic to metal pipe or fixtures since different thicknesses of walls result in varying outer diameters, although the inner diameter may be the same.

This particular trouble is about to be remedied. The producers of solvent welded pipe have come to an agreement with respect to sizes and will shortly have a commercial standard established through the Dept. of Commerce. The producers of polyethylene pipe are already well standardized on iron pipe sizes and are cooperating with other plastics pipe manufacturers and materials suppliers through S.P.I. to establish a research project at Battelle Memorial Institute which will give them valuable information on advisable test methods. These data can be used by pipe manufacturers and published as a standard for the information of consumers.

Insofar as inside pipe diameter permanence is concerned, the producers have already proved that plastics pipe remains relatively unaffected by corrosion, whereas flow through metal pipe—copper, steel, or wrought iron—decreases steadily in service, at a rate depending upon the mineral and other content of the water being transmitted.

Potentials . . . and Cautions

The story on plastics pipe could go on and on, but enough has certainly been told here to give some idea of potentials, provided that the industry steps carefully but firmly in strength, and avoids weaknesses. Eventually there should be enough business to make even some of the rosiest dreams come true, but there is a long trail ahead where dangerous ambushes can destroy all past gains unless careful preparation is made to guard against careless procedure.

It is hoped and believed that the S.P.I. Thermoplastic Pipe Div., set up to help coordinate the activities of plastics pipe manufacturers, will aid in promoting a healthy growth for the industry. For example, the Gas Distribution Engineers have been asked by S.P.I. to submit pipe sizes that are most desirable: if they want iron pipe sizes or solvent welded pipe sizes, that's what they will get. Then the Battelle pipe research project, sponsored by S.P.I., will provide data on bursting strengths, establish safe working pressures, determine the effect of water hammer, and other pertinent facts that can be taken up with the Gas Assn., American Waterworks Assn., Petroleum Institute, and a group of plumbers who make recommendations for plumbing codes.

The S.P.I. is also working with the National Sanitation Foundation in a study to determine whether or not the thermoplastics pipe presents a health hazard. Unless something unforeseen develops quickly, it is believed that a report from this group will soon be circulated to public health officials, indicating that most grades of thermoplastics pipe are suitable for potable water transmission for man or animal.—End

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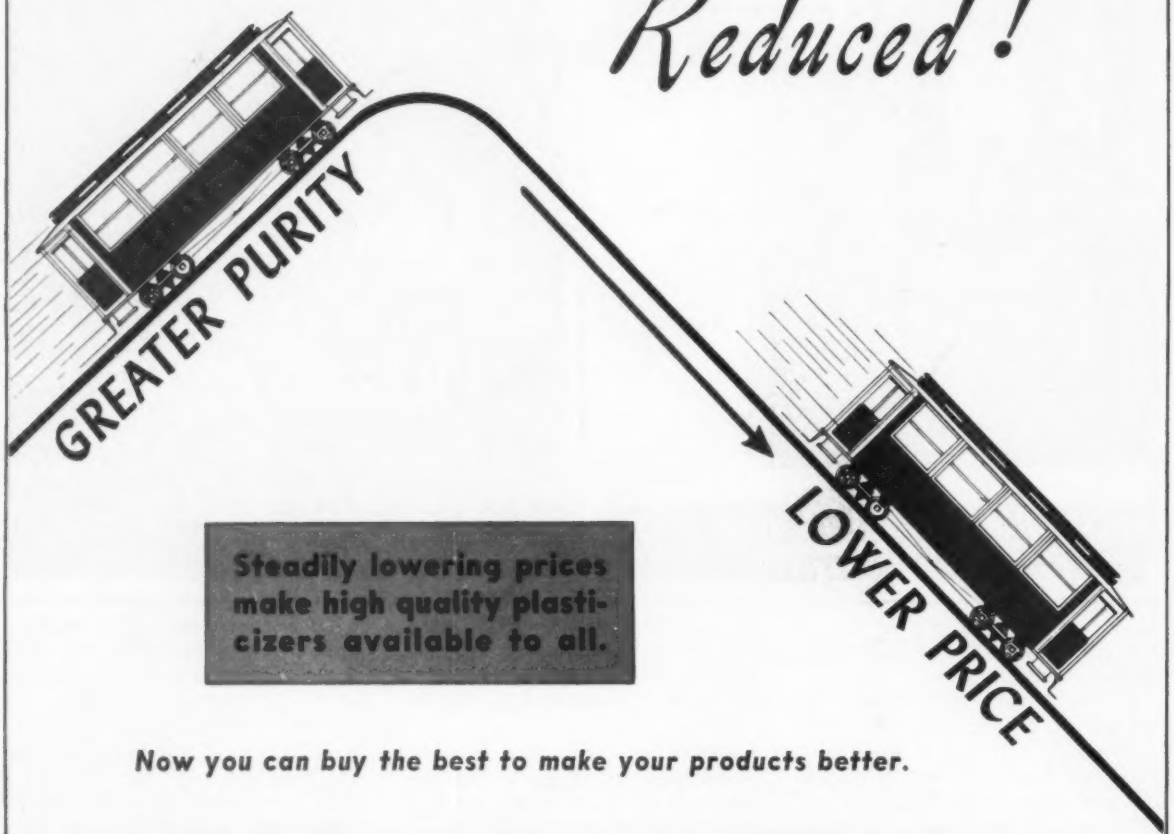

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IMPREGNATED MATERIALS FOR REINFORCED MOLDING. Bulletin on "Cordopreg" dry process impregnated materials and resins for economical molding of reinforced plastics. Materials available with controlled resin content. Cordo Molding Products, Inc. (C-402)

PLASTICS MATERIALS. Catalog contains data and price information on sheets, rods, tubes and films made on acrylic, vinyl, polyethylene, fluorocarbons, polystyrene, acetate, nylon and laminated materials. Commercial Plastics and Supply Corp. (C-403)

P.V.C. RESIN. Technical data on compounding and processing "Pliovic G8OV," a low temperature processing polyvinyl chloride resin with exceptional stability to heat and light. Goodyear Tire and Rubber Co., Inc. (C-404)

"DUREZ PLASTICS NEWS." Current issue of this house organ presents data on several interesting applications of thermosetting phenolic materials in photography, communications, housewares, and other fields. Durez Plastics and Chemicals, Inc. (C-405)

BONDING RESINS. Series of five bulletins on "Araldite" epoxy bonding resins for securing tight bonds between a wide variety of materials. Data on handling, application, storage, etc. Ciba Co., Inc. (C-406)

RESEARCH ACTIVITIES. Booklet summarizes the research activities of Godfrey L. Cabot, Inc., in connection with the development and use of finely divided powders and pigments for plastics. Godfrey L. Cabot, Inc. (C-407)

ELECTRONIC METAL DETECTION. Bulletin tells how R.C.A. electronic metal detectors are used to protect expensive calender rolls, embossing rolls, molds and dies from damage by automatically inspecting resins for tramp metal content. Radio Corporation of America. (C-408)

STRUCTURAL HONEYCOMB FOR SANDWICH CONSTRUCTION. Brochure on light-weight high-strength resin bonded "Hexcel" honeycomb core materials fabricated from aluminum, glass fabric, stainless steel, and cotton. Data on sandwich constructions, properties of various cell sizes, and applications. California Reinforced Plastics Co. (C-409)

AUTOMATIC SLUG-CHANGING PRESS. Data sheet on the "Kensol 24" air or hand operated press for personalizing plastics articles by hot stamping them with linotype slugs through colored or metallic foil. Slugs fed automatically from a magazine. Olsenmark Corp. (C-410)

FLAME RETARDANT FOR VINYLS. Bulletin on the use of antimony oxide as a flame retardant filler for vinyl plastics. Metal and Thermit Corp. (C-411)

POLYESTER RESINS. Publication discusses the catalysts, fillers, and pigments used with polyester resins and describes the principal fabricating methods. Lists suppliers of glass, fillers, etc., required for production of reinforced plastics. General Electric Co. (C-412)

TUBES FOR HF PLASTICS SEALERS AND HEATERS. Catalog lists the characteristics of various tubes used in electronic sealers and heaters for plastics. Amperex Electronic Corp. (C-413)

VINYL STABILIZERS. Series of five data sheets cover the physical properties of Harshaw-V-Stabilizers for increasing the heat and light stability of polyvinyl chloride, plastisols, and other vinyl copolymers. The Harshaw Chemical Co. (C-414)

INORGANIC COLORS. Color sample card illustrates 26 popular Ferro inorganic pigments formulated for coloring vinyls, melamine, styrene, acrylic, polyester and other plastics resins. Ferro Corporation. (C-415)

PERFORATING OF PLASTICS. Folder contains sample swatches of films, rigid sheets, and coated plastics perforated with various sizes and spacings of holes for ventilation, air escape, light transmission, and decorative applications. The Harrington and King Perforating Co. (C-416)

STYRENE. Booklet gives information on the manufacture of "Styron" polystrene, explains the various grades available and tells how polystyrene is employed in the molding of household appliances and accessories. The Dow Chemical Co. (C-417)

PHYSICAL PROPERTIES OF SYNTHETIC ORGANIC CHEMICALS. Guide for users of organic chemicals lists more than 320 products including plasticizers, esters, ketones, chlorine compounds, and the like. Carbide and Carbon Chemicals Co., Div. Union Carbide and Carbon Corp. (C-418)

REINFORCED PLASTICS MOLDING. Booklet illustrates the production facilities and typical reinforced plastics moldings for consumer and military use manufactured by Lunn Laminates, Inc. (C-419)

GRINDER. The vibrationless Model PG-7 centerless grinder with automatic hopper for production of circular formed parts made of plastics, wood, ceramics, or hard rubber is described in a specification bulletin issued by Royal Master Metal Products Co. (C-420)

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HYDRAULIC PRESSES. Specification data on Logan hydraulic presses, ranging from 25 to 400 tons, for compression and transfer molding, laminating, and other applications. Logan Engineering Co. (C-422)

"RESIN REVIEW." Current issue of this Rohm & Haas house organ contains articles on the curing of polyester resins, the economics of plasticizer selection for vinyls, and other pertinent subjects. Rohm & Haas. (C-423)

REVOLVING JOINTS. Data and specifications on Rotherm revolving joints for use on steam, air, oil, gas and water lines. Rotherm Engineering Co., Inc. (C-424)

PLASTICIZER SELECTION CHART. Handy chart indicating recommended Baker plasticizers for cellulose, vinyl, and other resins. The Baker Castor Oil Co. (C-425)

TESTING INSTRUMENTS. Testing instruments for determining weight, bulk or thickness and bursting strength of plastics, metal, fabric, paper, rubber, foil, glass, etc., are described and illustrated in a pamphlet issued by E. J. Cady & Co. (C-426)

TRANSLUCENT STRUCTURAL PANELS. Folder explains how colorful "Corrulux" corrugated reinforced plastics panels may be used as skylighting, in partitioning, in greenhouses, and in other structural applications. Libbey-Owens-Ford Glass Co. (C-427)

HEATING PLATENS. Bulletin on steam and electric heating platens lists standard sizes available from stock. T.H.&J. Daniels, Ltd. (C-428)

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LACQUER FOR STYRENE. Question and answer leaflet on New England gloss lacquers for finishing styrene. New England Lacquer Co. (C-430)

INJECTION MOLDING MACHINE. Specifications and performance data on the 8-oz. Fellows injection molding machine. Fellows Gear Shaper Co. (C-431)

PANEL SAW FOR SIZING SHEET STOCK. Description of several models of a panel saw which may be used for sizing corrugated structural plastics panels, sheet plastics and other sheet materials. Hendrick Manufacturing Corporation. (C-432)

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POLYETHYLENE FILM. Technical data on Visqueen polyethylene film, and on polyethylene in general. Tables list physical properties, chemical resistance, transmission rates, electrical properties and the like. The Visking Corp. (C-434)

P.V.C. PLASTICIZER. Data on "Staflex MP", a new dialkyl phthalate plasticizer designed to replace DOP. Deecy Products Co. (C-435)

ELECTRIC HEATING UNITS. Extensive catalog illustrates and describes various "Chromalox" strip, band, tubular, immersion, cartridge, and other heaters for use in plastics processing. Price list included. Edwin L. Wiegand Co. (C-436)

HOPPER LOADER. Description of a motor driven elevating conveyor unit for plastics injection and extrusion machines which mechanically feeds material from the container to the hopper without manual handling. Thoreson-McCosh, Inc. (C-437)

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PEARL ESSENCE. Bulletin reports how pearl essence is used to give an unusual finish to plastics products by coating and by including it within the resin itself. Mearl Corporation. (C-441)

VALVES. Booklet covers the construction, features and operation of hand, foot, and power operated valves for use with air and hydraulic cylinders and motors. Ledeen Mfg. Co. (C-442)

THICKENING AGENTS FOR PLASTIGELS. Technical service bulletin discusses the value of metallic soaps and other materials as thickening agents in the processing of plastigels. Metasap Chemical Co., Inc. (C-443)

VACUUM FORMING MACHINE. Folder describes and illustrates a completely self-contained high-speed vacuum forming machine for thermoplastic film and sheet. Includes built-in air-compressor, mold clamp frame assembly and a hydraulic pump. Specifications included. Pampco Industries, Inc. (C-444)

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Precision-Molded

(*Continued from p. 89*)

into the molded-in cavity on top of the frame and locked in place with a machinist's clamp. The operator drills horizontally through the adjacent wall of the frame, the acrylic sheath, and out the opposite wall of the frame. From this opposite side, a steel Esna Rollpin is forced into the hole, leaving 1/32 in. clearance at either end for added protection and neater appearance.

The entire level is then removed, turned around, and re-inserted between the retainer plates. The sheath, which is now hinged with a dowel on only one side, is again clamped into place in the cavity. This time, however, a fine screw action on the machinist's clamp is used to adjust the loose end of the sheath up or down in the frame. When a true level has been reached, the sheath is locked in place and the loose end is drilled and pinned to complete the assembly.

Plumb Inserts

When the sheath and frame have been assembled, the level is tested for accuracy. If approved, the level moves along to the final assembly operation. Here, two plumb inserts, which also consist of glass bubble vials embedded in acrylic, are cemented into the two molded-in openings in the frame. Dowels are then inserted through the frame and the acrylic plumb inserts to make doubly sure that the glue line will not fail in use.

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Now that plastics have proved themselves in the 24-in. level, new opportunities are opening for the material in the production of even larger size levels. A 4-ft. all-plastics model, weighing only 21 oz., has already been made and is now being tested for practical use.

CREDITS: Level designed and molded by Creative Plastics Corp., Stony Brook, N. Y.; Lustrex styrene supplied by Monsanto Chemical Co.; Lucite acrylic supplied by E. I. du Pont de Nemours & Co., Inc.

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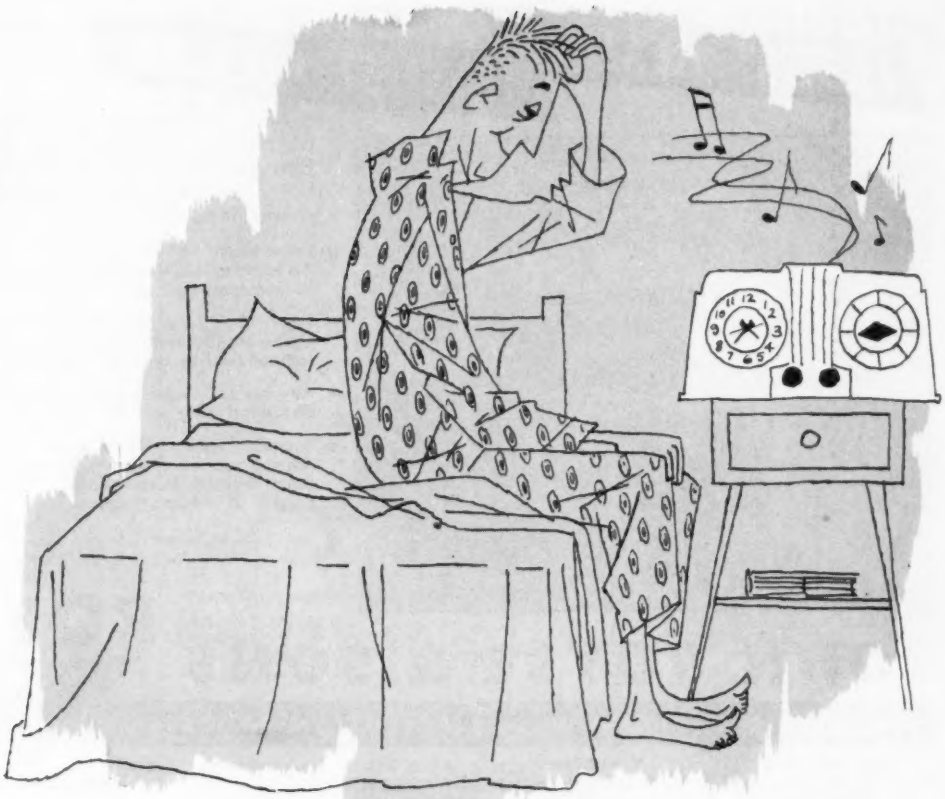

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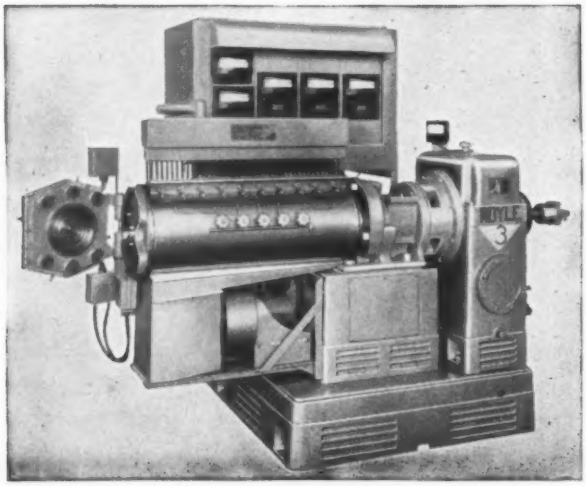

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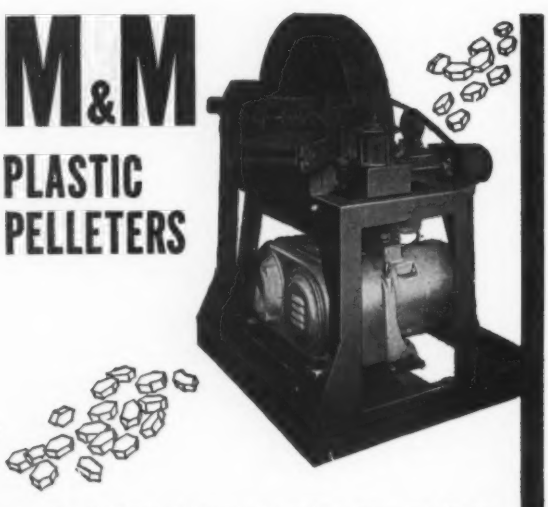

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Manikin

(*Continued from p. 93*)

out at room temperatures. The multiple-part mold is then disassembled to enable the 125-lb. manikin, with its undercuts and irregular contours, to be lifted out in one piece from the mold. Although the plaster mold itself had originally been cast in one piece from the clay model, it was sawed into several parts just prior to the lay-up. These parts were then reassembled into a single set-up and mechanically clamped in place during production of the manikin.

Only those parts of the body which are to be exposed—the hands, fingers, face, hair, and shoes—and the base of the manikin are painted. The rest of the body is clothed in shirt and pants. Actually, since the figure is not rounded, the shirt and pants are only "semi-clothes" that have had their back half cut completely away. After being draped over the body of the manikin, the clothes are snap-fastened to the base.

Vinyl Skin

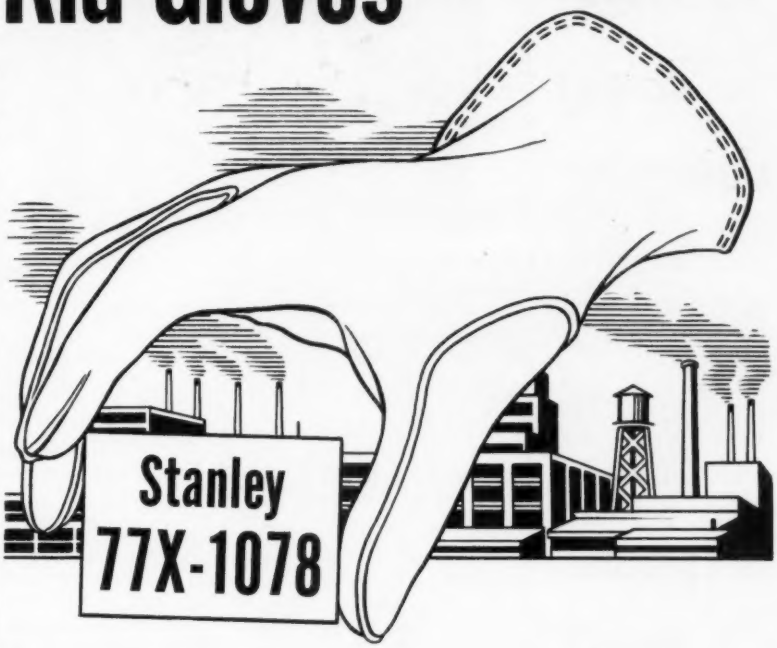
Molded vinyl plastisol sections, with appropriate gashes and tears cut into them, are cemented or taped to various parts of the reinforced plastics body to simulate skin. These skin sections are made by brushing liquid vinyl plastisol into a metal mold and subjecting it to cure by heat.

After cure, the vinyl sheet is removed and air-brushed with lacquer to reproduce the bruises and grime that usually accompany wounds. The sheet is then tacked on to those parts of the reinforced plastics body where wound problems are to be visually demonstrated. Since several sections, each differing in size or type of wound, are available for each area, the first-aid problem can be changed by simply removing the tacked-on skin section and substituting another vinyl sheet.

To ensure perfect register between the contours of the skin section and the contours of the body, the skin sections were molded first and then used by the sculptor of the original clay manikin as a guide to shaping the body.

Underneath the manikin shell is a storage tank, a centrifugal pump, and a network of Neoprene tub-

Kid Gloves FOR INDUSTRY



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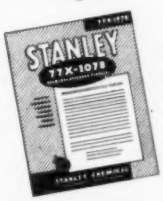

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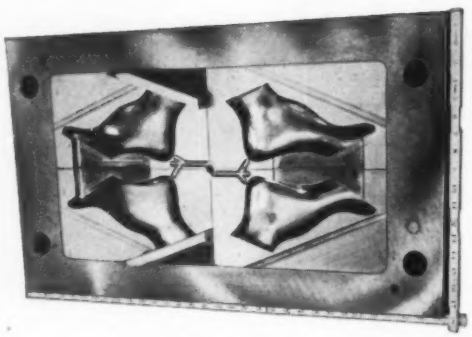
how do you determine the cost of a plastic mold?



Do you look at the price tag? Sometimes it's misleading! Take the so-called "bargain" mold, for example. As long as you use it, you never stop paying for it . . . in excessive rejects, headaches, and production tie-ups. For somewhere in its making somebody skimped on materials, care, or skill. To accurately determine how much a mold costs, measure the initial price against results.

And if you buy plastic parts outside, it pays to consult a reliable custom molder, backed by a skilled moldmaker. Together, they design and build a mold to fit the job. The extra care, skill, and better quality steels they use, more than pay for themselves in greater production of fast-selling parts.

For years, reputable moldmakers have relied on Carpenter Electric Furnace Mold Steels. Their workmanship plus the constant improvements Carpenter is making in already successful mold steels, give you double assurance of economical molds in the long run. The Carpenter Steel Co., 112 W. Bern St., Reading, Pa.

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ing that comprises the circulating "bloodstream" of the casualty.

The blood is actually a mixture of glycerine, water, and red vegetable dye. When a problem is being demonstrated, the blood is pumped from the storage tank through the tubes directly to the site of the wound. The tubes are fitted into small holes drilled into the reinforced plastics body under the open gash or tear. Various valve arrangements at the mouth of the tube can be adjusted by the instructor to control the amount and manner in which the blood flows from the wound.

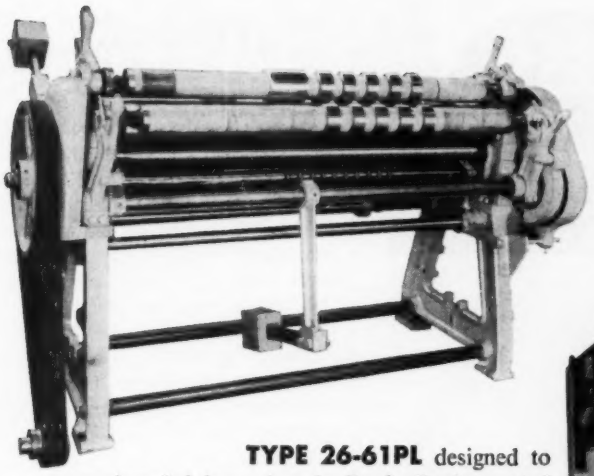
Thus, the blood can be made either to dribble slowly from a wound, as in the case of a fractured jaw, or to gush out profusely and rhythmically as it would from a severed artery in the arm. Even realistic sound effects have been added. By attaching a rubber bulb with a sponge forced into its neck to the tube that leads to the chest, the sucking noises that usually accompany a puncture wound in the chest are reproduced.

Unless proper first-aid care is administered to the manikin, it will continue to lose blood. As the liquid flows out of the wound, it is collected in one of several metal drains molded-into the base. It is then returned through another network of tubing to the storage tank for reuse.

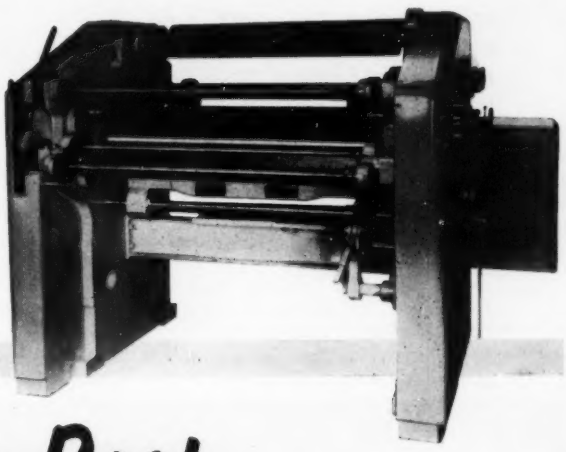
First-aid techniques work as well with the manikin as they would with a human being. Because the centrifugal pump does not build up pressure, a tightly tied bandage over the wound will stop the flow of blood. The pressure of a tourniquet will also stop the flow by sealing up the tube carrying blood to the wound. Fingers can even be inserted into the flexible mouth of the manikin to remove a foreign object.

As gruesome as it may be, the realism of the plastic manikin is expected to play an important part in helping to indoctrinate military personnel to their roles as emergency physicians in the event of an atomic attack or other emergencies.

CREDITS: Manikin was developed by Naval Dental School, National Naval Medical Center, Bethesda, Md. It was molded by Rogay Industrial & Commercial Models, Inc., Washington, D.C., using Marcothix and Marco 28C polyester resins supplied by Celanese Corp. of America, and fibrous glass cloth and mat supplied by Owens-Corning Fiberglas Corp. Vinyl plastisol supplied by Bakelite Co.



TYPE 26-R-7 Camachine with razor blade slitting for light gauge plastic film, producing high quality rolls of varying width and diameter at speeds up to 700 fpm.



TYPE 26-61PL designed to produce *lightly tensioned* rolls of adhesive coated plastics (and similar materials) to help overcome a tendency toward excessive adhesion of plies in the finished rolls, especially after long storage.

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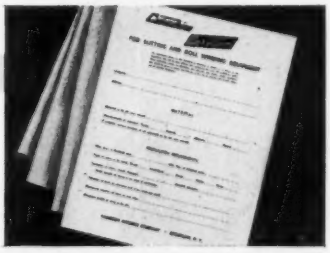

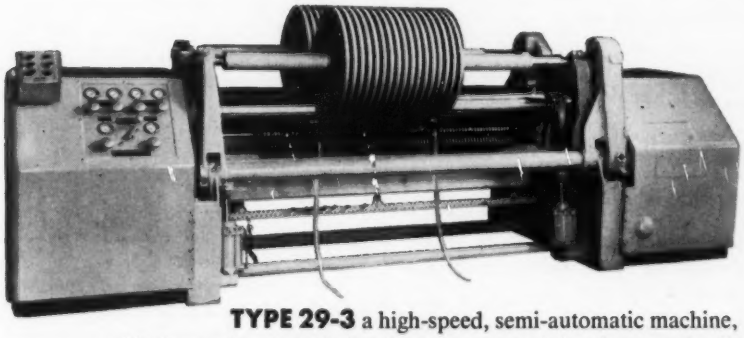

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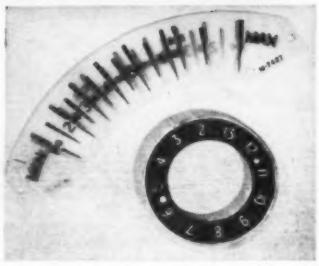

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Efficiency

(*Continued from p. 110*)

sequence is timed in conjunction with the mold opening so that, as the force plugs are turned, sufficient space is made available between the forces and cavities for the cap to retract from the force yet remain held from turning by the cavities until the unscrewing sequence is completed. The travel of the racks is so adjusted that the caps are not quite completely unscrewed. Thus, as the cavities drop away from them as the mold continues to open, the caps are held suspended by a very small portion of the last parts of the threads on the force plugs. An unloading tray designed to slide between the force plate and cavity plate is then pulled into position so that it will catch all of the caps as they are removed from the force plugs.

In Fig. 5, the operator has just pulled this unloading tray completely forward, thereby catching all of the caps in it. The operator then pushes the tray back from between the center plates. This tray is designed so that after it is fully retracted it unloads the completed closures into a special hopper at the back of the press, shown just below the material hopper in the center of Fig. 3.

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A system of knock-outs is so designed that, as the molds reach their fully opened position, the network of sprues and runners is knocked out of the runner plate as shown in Fig. 5. The next operation (Fig. 6) is for the operator to remove the one-piece network of sprues and runners preparatory to starting the next molding cycle. A material grinder located near each machine regranulates the sprue and runner network so that the material may again be placed in the material hopper.

The injection machine refinements described in this article indicate the improvements made by this one company within the past few years. Even at that, the molder sees still more things to be done. For example, a new development now being worked on will use superheated air in the jet loading hopper to accomplish heating and drying of the molding material before it is delivered to the injection cylinder.—END

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Hardening Speed

(*Continued from p. 118*)

chain size. By keeping the hydroxyl positions constant, the effect of chain size, as indicated in Fig. 6, p. 118 is evident.

Since these hexa-hardening rates vary with chain size, molecular distribution of a resin will have some effect on hardening speed. However, the general commercial resins tend to have about the same distribution pattern. Thus, for commercial resins this known distribution effect is considered negligible, and the measurements are made at constant distribution.

Conclusion

The effect of straight chains as contrasted to ring-branched chains is not yet well enough understood in the phenolic field to enable final judgement as to its importance in hexa-hardening. The data as now known indicate that branching, at a size of say eight-ring members, is a minor factor in hexa-hardening speed.

Thus, the two main factors of phenolic resin structure which influence hexa-hardening rate are chain length and the position of the hydroxyl on the ring. These factors, each divided into three even parts of high, medium and low, give a convenient rate background against which to compare various phenolic resins.

In Fig. 7, the working range for solid phenolic resins, fusible enough to flow and to be hardened with hexa, is covered by a range of 5 to 240 sec. at 160° C. The present large-volume commercial phenolic resins as used with hexa in current molding mixtures generally are included in the range from 20 to 80 seconds. Special resins, possessing medium flow properties, are now being subjected to tests at the 10- to 20-sec. hardening range.

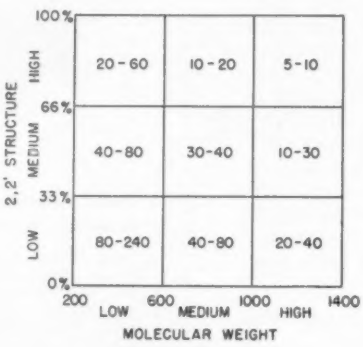

Fig. 7—Hexa-hardening speeds of solid phenolic resins, fusible enough to flow. Figures in nine-fold table refer to time (in seconds) required for the resin to harden at 160° C.

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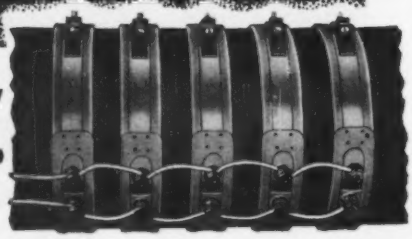

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Changes in Vinyls

(*Continued from p. 120*)

maximum annealing temperature, D, is not approached too closely. The change, AF, represents shrinkage during the annealing or stabilizing process.

The change in slope at E correlates well with the softening point of the plastic and with the glass transition temperature determined in other ways. Specimens cut in the same direction from a single sheet show almost identical slope, transition temperature, and shrinkage. Specimens cut at right angles to one another, i.e., with and crosswise to the direction of calendering, show relatively big differences in slopes and shrinkages. The glass transition temperature is independent of grain (calendering) direction, and is only slightly dependent upon compounding in the rigid range.

Tests on specimens cut from a cross-grained plied-up sheet showed shrinkage values about equal in the two directions.

The coefficients of expansion relative to steel can be computed from the slopes. Coefficients of expansion, corrected by using a value of 10×10^{-6}/°C. for steel, are presented for several materials under various conditions in Table I.

The data given cover a range, since they are dependent upon grain direction. The expansion along the grain is given first each time. Note that there is no constancy as to order of values.

The volume coefficient of expansion has been measured in pycnometers, using water as the fluid. Coefficients of 3.0×10^{-4} cc./cc./°C. and 3.6×10^{-4} were found for Geon 404 and 8700, respectively, in the range 25 to 50° C. These reduce to linear coefficients of 100×10^{-6} and 120×10^{-6}, respectively, which may be compared to the values listed in Table I. In this range, the pycnometer method is not as accurate as the linear differential method.

Discussion

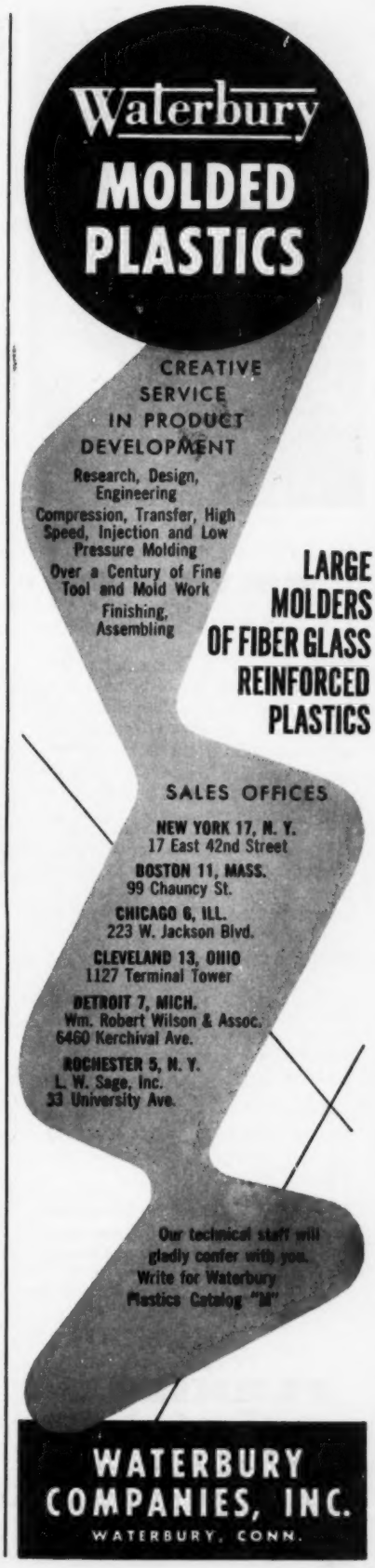
This test shows that thermal expansion and contraction behavior depends upon the history as well as the composition of the material. The shrinkage which occurs in the annealing process, i.e., in the first cycle of heating and cooling, is just another example of "plastic memory." The amount of such shrinkage limits use where extreme stability of dimensions is required in the final end product.

Obviously, it would be easy to modify this test to measure dimensional stability. Instead of following length changes in specimens at small temperature intervals, measure the change in length at room temperature arising from an arbitrary annealing procedure. Since the changes are relatively rapid above the transition temperature, which is about 70 to 80° C., annealing temperatures of 100 to 120°C. are suggested. A few tests have shown that about half the total change will be over in about 10 minutes. Further change in dimension takes place at decreasing rates.

The effect of calender grain direction upon the thermal expansion and contraction behavior is surprisingly large. For some uses, cross-plied sheets may have to be used to get sufficiently stable material. In other products, such as rigid piping in which grain comes from the extrusion process, different expansion coefficients along the length and diameter dimensions, will also have to be expected.—END

Table I — Thermal Expansion Coefficients of Rigid Vinyls

Material	T_g	*Shrinkage at 25°C.*	*Coefficient of Expansion* $\times 10^{-6}$/°C. *Before Annealing*	*After Annealing*	*Above* T_g
	°C.	%			
Geon 103	75	1.2-1.3	66-73	69-69	170-175
Geon 404	80	1.2-1.8	64-72	69-73	204-131
Geon 8700	70	1.2-1.6	81-77	82-125	160-154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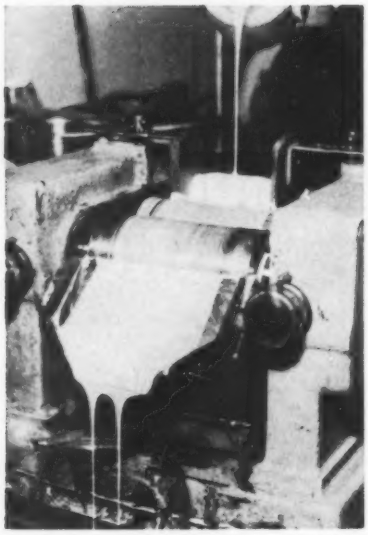

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Epoxidation

(*Continued from p.* 123)

These reactions find a variety of applications today, particularly in the plastics field.

Polyvinyl chloride resins must be plasticized to manufacture vinyl film, hose, and other products. If we attempt to mill an unsaturated fatty ester with the resin, we find little or no compatibility. If we epoxidize the fatty ester, the resultant epoxy compound is now completely compatible with the vinyl resin and an efficient plasticizer. Epoxy fatty acid ester plasticizers represent an important new family of plasticizers (2), distinguished by simultaneous plasticizing and stabilizing ability. By variation of structure, epoxy fatty acid ester plasticizers can be custom built to give low temperature flexibility, permanence, and other desirable characteristics.

Castor oil is a triglyceride of a hydroxy oleic acid (ricinoleic acid). Castor oil itself, the esters of ricinoleic acid, and the acetylated ricinoleic acid esters have found application as plasticizers for cellulose nitrate, natural and synthetic rubber, and polyvinyl chloride. Structurally related hydroxy and acetoxy acids and esters can be readily prepared by hydroxylation of unsaturated fatty acids and esters, derived from readily available oleic and linoleic acid containing fats and oils. These are now available (3).

Epoxy compounds, e. g., epoxy fatty acid esters, have come into wide use in recent years as stabilizers for polyvinyl chloride resins as well as for chlorinated paraffin and chlorinated rubber. Metallic soap stabilizers used in conjunction with epoxy compounds appear to give a synergistic effect on polyvinyl chloride stabilization. Recently, metallic epoxy soap stabilizers (4) with most interesting properties have been developed for chlorinated polymer use.

Epoxystearic acid and dihydroxystearic acid are interesting intermediates for resin application because of their polyfunctionality. Modified alkyd resins (5) of increased toughness can be produced from them. Synthetic drying oils (6) can be produced by pyrolysis of epoxystearic acid or hydroxy acyloxystearic acids.

Epoxy polymers, e. g., Epon and Araldite, have attracted considerable attention in recent years and represent one of the fastest growing resin families (7). These polymers contain two terminal epoxy groups per polymer chain and are produced by condensation of bisphenol and related compounds with epichlorohydrin. Considerable interest and activity has been shown in the preparation of epoxy polymers through epoxidation with hydrogen peroxide or a peracid. Epoxy polymers, in the form of resin esters, find wide application as protective coatings prepared by air drying, or by baking with melamine and urea resins. In the unesterified form, they may be baked with phenolic, urea, and melamine resins to give tough coatings with excellent flexibility, chemical resistance, and adhesion. Unesterified epoxy polymers can be similarly crosslinked with polyamines to give three-dimensional infusible polymers of interest for potting, laminating, adhesive, and coating use. Room temperature curing systems are available.

A major interest in glycols and epoxy compounds lies in their use as intermediates, that is, as building blocks in the creation of new, more complex end products, be they fibers, dyes, or medicinals. Hydroxyl groups present in glycols are reactive groups, capable of undergoing many valuable reactions, e. g., esterification, oxidation, and sulfation. Epoxy groups are particularly unique in reactivity. As we have noted, the epoxy group is a three-membered ring compound. This is a strained configuration of great potential energy—a very reactive chemical structure. Because of this reactivity, a wide variety of chemicals react with the epoxy group to form new and valuable intermediates. In all cases, the epoxy ring opens. Accordingly, we find epoxy compounds widely used in organic synthesis to attach new valuable groups to a given skeleton structure. This is at the heart of the use of hydrogen peroxide and peracids in the creation of new resins and plastics. Epoxy plasticizers, too, are dependent on the epoxy group reactivity, for they owe their stabilizing properties to the ability of the epoxy group in the molecule to absorb hydrochloric acid split from the resin under the action of heat and light.

What peroxygen compounds are recommended for epoxidation-hydroxylation use? Hydrogen peroxide

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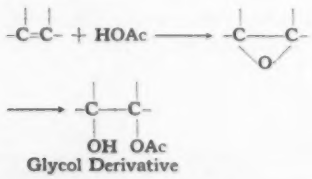
in the form of 35, 50, and 90% solutions or peracetic acid may be used.

Hydroxylation reactions are generally carried out via "in situ" techniques, i. e., hydrogen peroxide is added to an acetic acid or formic acid solution of the unsaturated compound containing 1% of a mineral acid such as sulfuric acid.* The mineral acid catalyzes formation of peracid in the reactor (8), thus:

$$H_2O_2 + HAc \xrightarrow{\text{Acid Catalyst}} HOAc + H_2O$$

Hydrogen Peroxide + Acetic Acid → Peracetic Acid + Water

Simultaneously, the peracetic acid formed reacts with the unsaturated compound, thus:



Glycol Derivative

The net effect is the total consumption of hydrogen peroxide and formation of a glycol derivative. The 35 and 50% hydrogen peroxides are to be particularly recommended here.

By contrast, epoxidation reactions are most readily carried out with a preformed peracetic acid. This may be purchased peracetic acid, or peracetic acid prepared on the spot by the ultimate consumer from hydrogen peroxide (8). For the latter, 90% hydrogen peroxide is best.

Considerable interest exists, for reasons of convenience and economy, in the development of "in situ" techniques for epoxidation use.

Development of such processes poses serious difficulties based upon the necessity of providing reaction conditions allowing for peracid formation without causing epoxy ring opening. Generally, the very conditions favoring peracid formation, e. g., presence of mineral acid catalyst and high temperatures, are deleterious to survival of the epoxy ring. The dilemma can only be solved by delicate balancing of reaction conditions.

A few successful "in situ" processes have been developed; only one has been published (9). A simple and economical "in situ" epoxidation process has been developed in our laboratories, utilizing acetic acid, and will soon be reported in a paper (10).

These considerations underlie interest in epoxidation-hydroxylation. How will industry use such reactions? At present, we note insecticides, plasticizers, pharmaceuticals, lubricants, resins. Others will follow.

* When formic acid is used, the mineral acid catalyst may be omitted.

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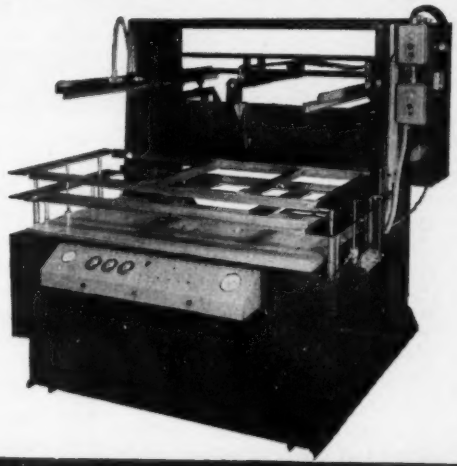

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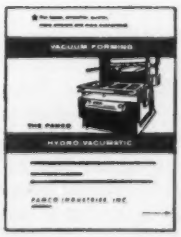
No other vacuum forming machine offers so many "extras" as the ready-to-plug-in Hydro-Vacumatic. Job-readying time is shortened by its all-in-one construction. The completely adjustable mold clamp frame assembly takes a wide latitude of multiple forming dies, inexpensively produced from plaster or phenolic resins as well as wood and metal. The three banks of the heater can be used in any combination for cost savings.

The Hydro-Vacumatic can be operated automatically, semi-automatically, or manually to form a wide variety of objects with arresting combinations of color and three-dimensional effects, providing exact detail and register on preprinted thermoplastic sheets. The heightened concentration and reduced fatigue resulting from its noiseless hydraulic action shortens the production cycle and increases the number of perfect pieces.



YOURS for the asking!

The latest advances in vacuum-forming and drape-forming are outlined in this illustrated folder. It gives additional details and specifications on Model HV-30-60 and other models of the Pamco Hydro-Vacumatic. It also indicates the wide range of items that can be vacuum-formed—including display pieces, signs, consumer products, appliance parts, instrument panels, and other industrial parts.

● ***Don't delay*—write, call, or wire today for your free folder and to arrange your special demonstration of the Hydro-Vacumatic.**

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THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

New Styrene Copolymer

AN interesting new resin whose light seems to have been hidden under a bushel basket is worthy of being called to the attention of our readers who are interested in a styrene copolymer resin that can be calendered, extruded, injection molded, or compression molded. It can also be formed into sheets for fabrication that will compete favorably with most of the plastics sheet materials presently available on the market.

The new resin was officially introduced to the trade last fall as Goodyear's Plio-Tuf G75C. It is a pure resin copolymer containing only styrene and another unnamed monomer; but most of the trade has guessed that the second monomer is butadiene. It should not be confused with Goodyear's Plio-Tuf GP which was introduced several years ago. The latter was a high styrene-butadiene resin blended with GRS rubber and then cured. Plio-Tuf G75C, when compared to the old Plio-Tuf GP, shows the same great toughness but a new high in heat distortion point. In addition, processing is much simpler and easier with Plio-Tuf G75C. It does not contain rubber plasticizers nor curing agents, as did the replaced Plio-Tuf GP.

Plio-Tuf G75C is quite different from any of the other well-known high-impact styrenes, modified styrenes, and copolymer styrenes. To a great extent this difference is due to the previously mentioned absence of rubber in the compound. Yet Goodyear reports that Plio-Tuf G75C has seven times greater impact strength than high-impact styrene. Goodyear technicians also report that this resin is easier to process than rubber-modified styrene compounds on traditional plastics processing equipment. Absence of rubber is again the fundamental reason because the "nerve" in rubber is the factor that creates irritating little problems when rubber-containing styrenes are molded on plastics equipment.

Most of the Plio-Tuf G75C so far used has been directed toward the sheeting field. The sheet can be produced by extrusion in thicknesses from $\frac{1}{32}$ to $\frac{1}{8}$ inch. It can be calendered to almost any desired thickness. In thicknesses most generally used, the price will be around 95¢ a pound. This price compares to around $1.20 to $1.30 a lb. for rubber-containing styrene-acrylonitrile sheet and about 55¢ a lb. for rubber-modified styrene sheet, according to Goodyear representatives.

Plio-Tuf G75C sheeting is recommended particularly for vacuum forming. Television masks formed from this material seem especially practical. Refrigerator liner doors are another possibility. Housings, display signs, and various other products adaptable to sheet fabrication are under test.

Extruded pipe is another test item that looks promising. The unfilled resin could be extruded into tough, high-impact pipe that will reputedly withstand hammer blows without harm.

Goodyear sells the resin powder at a price of 52¢ a pound. Its specific gravity is 1.05 compared to 1.40 for vinyl and 1.03 for styrene compounds.

The heat distortion point is about 190° F. Its thermal stability eliminates the need for stabilizers and it does not require curing ingredients, accelerators, plasticizers, or modifiers, although they may be used if desired.

Fluorocarbon Tape

A PRESSURE-SENSITIVE adhesive tape, Temp-R-Tape T, which has a base of Teflon resin and provides a new and simple means for putting the resin's unique properties to work in a wide variety of applications, is now on the market. The extreme chemical resistance of Teflon and the wide range of temperatures over which it maintains its properties indicate that the tape will be used, among other things, for sealing high-temperature ducts and chemical ducts and as electrical insulation. Du Pont claims that the tape, having a silicone polymer adhesive, is completely effective over the temperature range of −80 to 400° F.

The material adheres readily to a variety of surfaces, including glass, aluminum, steel, phenolics, copper, and brass. It is available in widths from ½ to 12 inches.

Temp-R-Tape T is distributed by Connecticut Hard Rubber Co., 407 East St., New Haven 9, Conn.

Resin for Electrical Parts

ANOTHER polyester added to General Electric Co.'s line of resins is AR493, which possesses chemical and heat resistance superior to that found in conventional styrene polyester resins. S. L. Brous, general manager of G-E's Chemical Materials Dept., claims that the development of the new resin will contribute to the broadening of the reinforced plastics industry, as well as to the expansion of the electrical industry.

The company also expects AR493 to find wide acceptance among fabricators of exhaust ducting for chemical fumes, chemical storage and transportation tanks, washer tubs, and hundreds of other items presently restricted by insufficient corrosion resistance. The material's higher heat resistance favors its widespread use in electrical applications, where increased importance is being placed on higher operating temperatures and higher quality products. AR493 glass cloth laminates may be subjected to maximum continuous operating temperatures as high as 150° C., and intermittent temperatures as high as 250° C.

Hard Work Ahead

CREATING obsolescence is a specialty of the chemical industry, according to the year-end statement of J. R. Hoover, president of B. F. Goodrich Chemical Co., Rose Bldg., Cleveland, Ohio. Industrial chemistry, in an effort to obtain markets, must continue to strive for the replacement of many long-established products, as well as for the im-

* Reg. U. S. Pat. Off.

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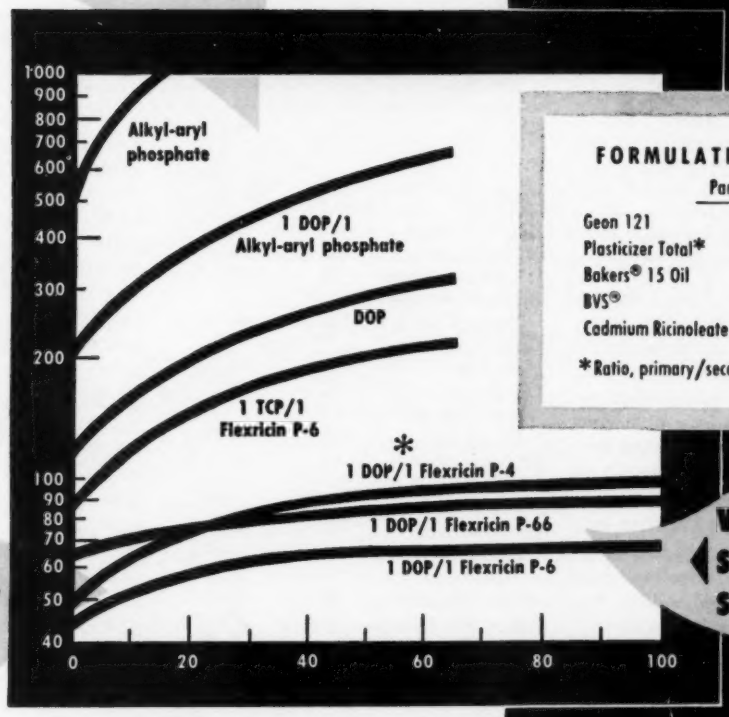

FORMULATION

	Parts (wt.)
Geon 121	100
Plasticizer Total*	63
Bakers® 15 Oil	1
BVS®	1.6
Cadmium Ricinoleate	.8

*Ratio, primary/secondary

TIME — DAYS: 25°C at 48% R.H.

YOUR CHOICE:

Flexricin P-4 Methyl Acetyl Ricinoleate
Flexricin P-6 Butyl Acetyl Ricinoleate
Flexricin P-66 Isobutyl Acetyl Ricinoleate

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provement of natural materials. For this reason, Mr. Hoover stated, chemical companies should be permitted to select more practical rates for amortizing new facilities.

There are dangers ahead in the next few years because supply of most chemicals and plastics has caught up with demand, said Mr. Hoover, as he pointed out that it was hard to make a mistake in the chemical industry during the past 10 years, but that it will be much easier from now on. Thrift and salesmanship will play a greater part in 1954 corporate score sheets than in many past years. Only those organizations which prove themselves to be fundamentally sound will be capable of meeting this challenge, he remarked.

Polyethylene's Future

SUDDEN candidate for the honor of becoming the first billion-pound plastic is polyethylene, says one of our eminent contemporaries in the business publishing field. That "sudden" discovery is not so sudden to readers of MODERN PLASTICS who have been reading of that delightful possibility for more than a year.

Probably a much more significant prophecy is the MODERN PLASTICS estimate made in January of this year that polyethylene production capacity would reach a 45 million lb. a month capacity in late 1955 or early 1956. In its February issue article, Fortune magazine comes up with just about the same conclusion, except that its company line-up and amount to be produced by each is slightly different.

The MODERN PLASTICS estimate for the companies which will be producing and the amount for each is given here. All the figures, except Du Pont's and Texas-Eastman's, have been published by each of the companies concerned.

Estimates such as these change from day to day. The Koppers announcement came in while this article was being written and was not accompanied by proposed capacity figures. Allied Chemical has not announced when it would start its high molecular weight production — only its 20-million lb. low molecular weight plant has been announced so far. It wouldn't be at all surprising to have other company announcements come in before the end of 1954, but it seems impossible to believe that any such companies could start production in 1955 or even 1956. Indeed, it is almost certain that several of the companies listed will not be producing a suitable material in the volume announced by mid-1956 even if there should be enough demand. The optimistic 45 million lb. a month estimate by MODERN PLASTICS may well be 5 or 10 million lb. high if past history is any guide to the future. However, the various companies listed, except Du Pont, say they expect to operate at the above rates. Du Pont will make no commitment on future plans.

Estimated Polyethylene Production

Company	*Year*	*Annual capacity in millions of lb.*
Union Carbide—Charleston	'52	75
Du Pont—Orange	'52	65
Union Carbide—Texas City	'53	60
Union Carbide—Seadrift	'54	60
Du Pont—Orange	'54	40
Texas-Eastman—Longview	'55	20
Spencer—Orange	'55	45
Monsanto—Texas City	'55	66
Dow—Velasco	'55	25
National Petroleum—Tuscola	'55	25
Union Carbide	'55	60
Koppers	'55	?
Allied Chemical	?	?

The Fortune article stressed the possibility of sales problems that would extend from 1954 through 1957, a subject that was hammered out on page 214 of the April 1953 issue of MODERN PLASTICS and again in the January 1954 issue.

Everyone must of course wonder where all the new material is going to be used, but to our knowledge there has never been another plastic with a sales curve that scooted upward at such a rapid rate. It is expected that supply may exceed demand in the mid-1950's, but it is also expected that the sales curve will continue to rise.

Take film as an example. Our contemporary said sales must double and redouble over present production, which is about 40 million pounds. That would be 160 million lb. which, in our opinion, is a low estimate. Cellophane consumption is today about 300 million lb. a year. Many persons are gambling that polyethylene film will top that figure without cutting into the cellophane market. When transparency, printing, sealing, and machine handling problems are licked, as they certainly will be, polyethylene film uses will multiply manyfold. In price, it is already approaching cellophane, that is, 65¢ worth of 1½-mil polyethylene will give as much yield as 55¢ worth of cellophane, and the latter is being forced up by economic factors while the polyethylene price is declining. There isn't room to discuss this situation here, but polyethylene film prospects are mountainous. Prospects are also most promising for paper coating, laminating, and injection molding.

There are so many undisclosed markets that one's head fairly swims in attempting to contemplate the possibilities. Twenty million lb. could be used annually as a replacement for cork in bottle caps if polyethylene gets only 25% of the market. The entry of the three largest glass producers into the polyethylene bottle business foretells the future for that line of operation. The use of polyethylene coated paper or cellophane for milk, frozen liquids, and oil containers is another potential giant, and there are scores of other applications on the planning board and others not even dreamed of today.

The plastics industry must certainly welcome and appreciate the recognition which has been given to it by industry's glamor magazine in their polyethylene story. However, it would have been welcomed even more if a greater portion of the space had been devoted to why polyethylene is destined for greatness and less to a sales problem that is expected to be only temporary.

Furthermore, a great part of the

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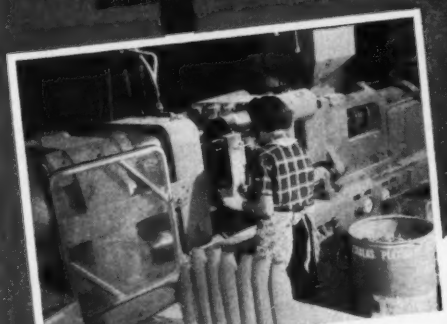
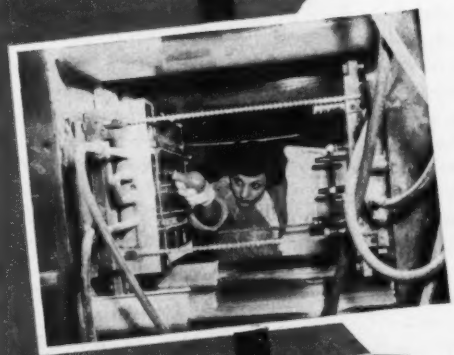
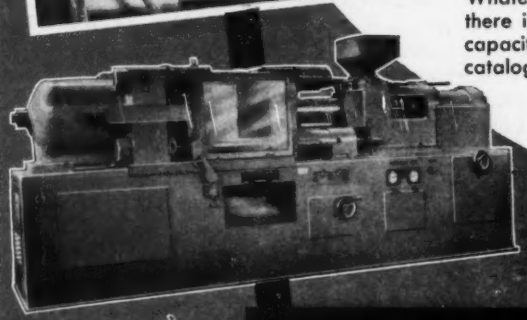
BRIDGEPORT MOULDED PRODUCTS INC.







Foremen and operators at Bridgeport Moulded Products, Inc., one of the largest and busiest contract injection molders in New England have these high praises for Watson-Stillman Injection Molding Machines:

"Maintenance in W-S presses is lower than on other machines"

"Our W-S machines are rugged. They stand the gaff of 24-hour-a-day production, showing lot less wear than other machines"

"Changing dies is easier"

"Heating units are simpler to clean out—easier to change over to new material"

"Greater clamping pressure is a feature for producing better molded parts"

Nine W-S Injection Molding Machines, varying in capacities from 12 to 60 ounce models—hour after hour, around the clock turn out thousands of difficult molded parts for this leading manufacturer.

Whatever your injection molding need may be, there is a W-S Machine from 12 to 300 ounce capacity, that will meet it. Send for our latest catalog.

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THE PLASTISCOPE

Fortune story was devoted to a long harangue over patent situations that are as common in this industry as are kittens to an alley cat. It isn't likely that patents held up polyethylene production for any great period of time; the great problem in obtaining more volume more quickly was and is production know-how. Even the original producers are still troubled with engineering problems that frequently interfere with production of a uniform product.

It also seemed unfair to imply that Du Pont knew nothing about polyethylene until 1941. According to chemical history, Du Pont first started experimenting with it in 1936 and was actively at work on a developmental scale in 1939. It is true that polyethylene was "discovered" by I.C.I. in England in the early 1930's and that the customary course was followed of taking out a patent in the United States soon thereafter, but Du Pont went to work immediately on a licensing arrangement and was hard at work on the project long before 1941. The 1941 incident only added fuel to the fire.

Phenolics Prices

ANNOUNCEMENT of a price reduction for most phenolic molding materials, phenolic resins, and phenolic resin solutions has been made by Bakelite Co., Div. of Union Carbide and Carbon Corp., 260 Madison Ave., New York 16, N. Y. The price cuts apply as follows: Most standard phenolic molding materials have been reduced 1¢ a lb.; unmodified phenolic resins, 2¢ a lb.; and resin solutions have been reduced according to the solids content. For example, a 50% solids content solution has been reduced ½¢ a lb., while a 75% solids solution has been reduced 1½¢ a pound.

Modified Urea Resins

A SERIES of processes for making modified urea-formaldehyde resins has been developed by Sharples Chemicals, Inc., 123 S. Broad St., Philadelphia 9, Pa. One type is derived from urea, formaldehyde, and sugar and is being proposed for adhesives, core binders, treating agents for paper and fabrics, and surface coatings. Others are made from formaldehyde and alkyl- or alkylol-urea and can be used alone in coating or impregnating compositions, or as resin additives.

H. L. Barnebey, P. O. Box 144, Pittsburgh 30, Pa., has been appointed exclusive licensing agent.

Catalin's Quarter Century

ON the occasion of the 25th anniversary of the establishment of Catalin Corp. of America, the management has announced the completion of new production and research facilities begun last year. The plant expansion was financed by a stock offiering to previous common stockholders and was rapidly subscribed.

HARRY KREHBIEL

The company manufactures polystyrene molding and extrusion compounds; casting resins for tooling for sheet metal fabrication and for other industrial uses; synthetic resin adhesives; textile finishing resins; laminating resins; resins for foundry shell molding and core casting; impregnating resins for textile and paper treatment; bonding resins for cork, abrasives, fibrous glass and wood; transparent casting materials for photo-elastic stress analysis; and special resins used in the rubber, oil, agricultural, and coating fields.

The development of the corporation under the leadership of Harry Krehbiel, its president, shows a growth in net sales from $2⅓ million in 1941 to over $12 million in 1951, with expansion since then at an even accelerated pace. New and most modern facilities have been built in the past two years and a new styrene polymerization plant has recently come on stream. Catalin plants are located at Fords, N.J.; Thomasville, N.C.; and Calumet City, Ill. Warehouse facilities have been modernized at East Hampton, Mass.; Cleveland, Ohio; Chicago, Ill.; and Los Angeles, Calif. A district sales office is maintained at 221 N. LaSalle St., Chicago, while head office remains at 1 Park Ave., New York, N.Y.

Polyester Price Reduction

A REDUCTION of about 3¢ per lb. in the price of general purpose polyester resins has been announced by Reichhold Chemicals, Inc., 525 N. Broadway, White Plains, N. Y. The price cut brings the cost for these resins down to an average of 35 to 36¢ per pound.

Several qualities of polyester resins have also been cut in price by the Marco Products Dept. of Celanese Corp. of America's Plastics Div., Linden, N. J. In lots of 40 drums or more, MR-28V has been reduced from 40 to 36½¢ per lb.; MR-28C from 42 to 39¢; and MR-28R from 42 to 40¢ per pound.

Polyethylene Prices

NAMED Alathon 14, another type of polyethylene is being offered to the trade by Du Pont. It is characterized by somewhat higher flexibility, impact strength, and opaqueness, and is less crystalline than Alathon 10, which was introduced last summer. Alathon 14 is the forerunner of several new polyethylene types which Du Pont expects to introduce as markets require them.

The price of Alathon 14 is 41¢ a lb. in truckload lots or over. Alathon 10 has been reduced in price from 46 to 43¢ a lb. in truckload lots or over.

Silicone Glass Laminates

A NEW bonding resin for low-pressure silicone glass laminates, called Dow Corning 2106, has been developed by Dow Corning Corp., Midland, Mich. Typical ⅛-in. samples (30% resin, heat cleaned 181 cloth) show flexural strengths in the range of 50,000 p.s.i. at room temperatures even before curing.

High-temperature strength is obtained after relatively short cures —80 hr. at 480° F., or less than half the cure formerly required. Flex strength of 10,000 p.s.i. at 500° F. is reached in only 6 hr., indicating that in many applications these laminates may be cured in service.

The heat resistance and dielectric properties of the laminates qualify

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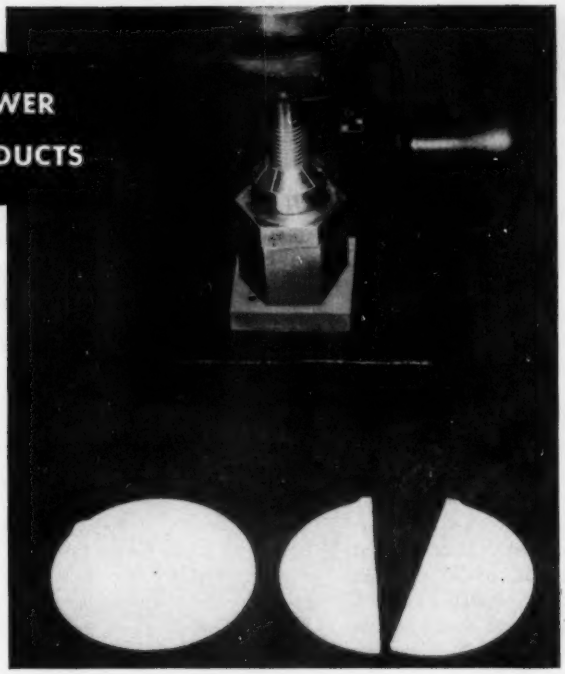
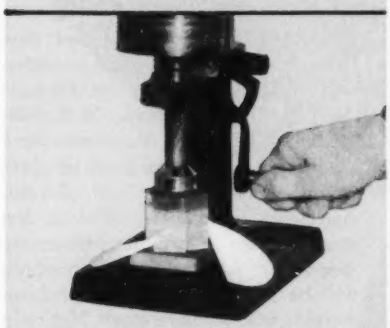
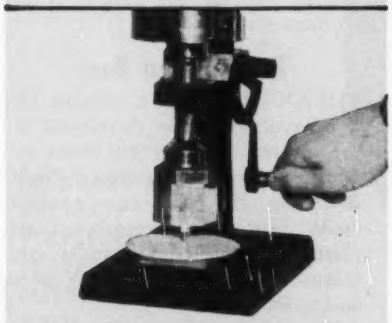
"Needle-Penetration" Toughness Tester consists of weighted needle and hand crank. Needle shown in raised position before being tripped to fall on test sample.



Comparison of discs made of Lustrex Hi-Test 88 (left) and general purpose styrene after needle penetration tests.



Descending needle shatters test disc made of general purpose styrene.



Falling needle punctures test disc of Lustrex Hi-Test 88 indicating the strong shock resistance, and excellent flexibility and elongation of this material.

Punishing impact test points way to product quality . . . with HI-TEST 88 LUSTREX Styrene Plastics

Consider what this dramatic demonstration of Lustrex Hi-Test 88 styrene can mean for your products. Now, at a time when your customers—manufacturers, retailers and consumers—are becoming more and more insistent on improved product performance, you can provide a competitive advantage with a stronger, tougher, more durable material.

Lustrex Hi-Test 88 styrene is *five times tougher* than general purpose material. In flexibility fatigue tests, Lustrex Hi-Test 88 shows two to five times *more flexibility* than other styrene impact materials. Yet it sells at a price you can afford, to upgrade your regular product line for greater selling power.

Lustrex Hi-Test 88 has good appearance, good color stability, and excellent moldability. It has outstanding vacuum forming characteristics. Can be extruded or molded. Because it orients less (and thus has less variation in internal stress), it is highly recommended where lacquering is done.

For full information, mail the handy coupon below.

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MONSANTO CHEMICAL COMPANY, Plastics Division, Room 2603, Springfield 2, Mass.
Please send me full information on Lustrex Hi-Test 88 styrene.

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them as Class H insulating materials; they are also suggested for structural parts which must combine light weight and high strength at elevated temperatures. While most samples to date have been laminated at 30 p.s.i. or less, indications are that laminates may also be made with high-pressure equipment.

Plasticizer at Low Cost

CUTTING costs, or at least attempting to, is a process as old as industry itself. But when a new material is introduced to an industry, the methods for cost cutting are not generally apparent until, through constant use and experimentation, ideas are brought forth that eventually result in lowered operating costs.

The vinyl chloride industry is an example of a relatively new enterprise in which the processors have now had time enough to work out various cost-reducing operations. Prominent in these efforts to obtain lower cost and yet retain quality standards is the use of lower cost plasticizers. Among these lower cost plasticizers is a fairly new one called to attention by its producer, Monsanto Chemical Co.

This butyl benzyl phthalate plasticizer, called Santicizer 160, is not only low-cost at 27¢ a lb., but also helps to increase production speed in the extruder because of its high solvent action at lower temperatures. It is especially recommended for use with polymeric plasticizers where the combined blend helps to produce a non-migrating, easy-flowing compound that has exceptional resistance to kerosene, gasoline, and similar materials. In clear garden hose, the use of Santicizer 160 in the compound helps to eliminate fish eyes. In opaque garden hose and other vinyl applications, Santicizer 160 is also recommended because it will wet the pigment faster than plasticizers with less solvent action.

A table indicating how Santicizer 160 speeds up extrusion rates when compared with two other plasticizers produced by Monsanto, is given herewith. The Santicizer 141, listed in the table, is alkyl aryl phosphate, which is not as heat stable as the phthalates; but when used as a blend it gives gloss, light stability, flame resistance, and it is non-toxic.

Butyl benzyl phthalate is more volatile than DOP and is not recommended when excessively low temperatures are to be encountered by the end product. But in thick sections, such as garden hose or vinyl tile, these properties are not particularly critical and if necessary other plasticizers can be blended into the compound to overcome such things as volatility and low-temperature brittleness. In some applications, Santicizer 160 is often recommended as a major plasticizing component. Vinyl asbestos floor tile is a particular example. In such compounds, Monsanto recommends that where typical formulations consist of 100 parts vinyl resin and 250 to 300 parts calcium carbonate filler and 100 to 150 parts asbestos filler, as much as 20 parts of Santicizer 160 can be used along with 15 parts of tricresyl phosphate and 5 parts of a polymeric type plasticizer, plus stabilizer and pigment, to complete the formulation. In such a formulation, Santicizer 160 helps to give oil or grease resistance and helps to give a good, hard surface that is desirable for floor coverings.

This same Santicizer 160 is also recommended by Monsanto for plastisols because it permits fusion at lower temperature and aids more rapid processing at the same temperature generally used for many other plasticizers due to its strong solvent and wetting action.

Caution is advised by Monsanto in using Santicizer 160 since it must be used before the plastisol thickens. Agents such as polyethylene glycol monooleates and monolaurates may be used to retard viscosity build-up of Santicizer 160 at low temperatures without affecting the properties of the plasticizer when it is used at fusing temperature.

Extrusion Rates Obtained With Various Plasticizers

	Extrusion rate (g./min.)— Laboratory or Bench Type Extruder, barrel temp., °C.				*Average extrusion rate over temp. range (g./min.)*
	160	*180*	*200*	*215*	
Butyl benzyl phthalate (Santicizer 160)	22.2	25.0	26.0	26.6	25.0
Octyl diphenyl phosphate (Santicizer 141)	17.3	20.0	21.0	18.0	19.1
DOP	11.7	15.8	16.7	17.4	15.4

Improved Class Roving

NEW control equipment and new methods of quality determination have made it possible for Owens-Corning Fiberglas Corp., 16 E. 56th St., New York 22, N. Y., to announce a tightening of its guarantee on glass roving consistency to ±5 percent. According to company officials, this improvement in product uniformity means that metered roving chopping will be more accurate and preform weights will be more exact. Not only does the company guarantee the new 5% tolerance over a whole ball of roving, but for the length of the yardage on the ball.

Fluorocarbon Hose

PRODUCTION of a unique line of synthetic hose developed for the aircraft industry has been announced by Resistoflex Corp., Belleville, N.J. The new product, made from a fluorocarbon-based plastic, is expected to handle synthetic fuels and oils for the latest design jet engines.

Edgar S. Peierls, president of the company, states that these new fuels and oils are subjected to temperatures heretofore not encountered in aircraft operation. Consequently, materials for handling them must be able to withstand these extreme temperatures; at the same time, they must also be chemically inert to resist corrosion.

Initial reaction by major aircraft producers to original test material

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- ***VINYL***
- ***ETHYL CELLULOSE***
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PLASTICS MATERIALS

703 BEDFORD AVENUE, BROOKLYN 6, N. Y.

Phone: MAin 5-7450

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THE PLASTISCOPE

developed by Resistoflex engineers was so enthusiastic, Mr. Peierls added, that a pilot plant was immediately planned to meet the urgent need for additional test material and small production quantities.

A large-scale Resistoflex plant, contemplated for the near future, is expected to handle the demand for the new product as soon as the aircraft industry has completed its tests.

Acrylonitrile Price Cut

A REDUCTION of 5¢ a lb. in the price of acrylonitrile has been announced by Monsanto Chemical Co.'s Texas Div., Texas City, Texas. R. U. Haslanger, general manager of sales, points out that the reduction, which brings the tank car price down to 31¢ a lb., is the second in six months for this raw material.

Stabilizer

DEVELOPMENT of a new lead compound, Stayrite 229, for stabilizing halogen-containing organic materials has been announced by Witco Chemical Co., 260 Madison Ave., New York 16, N.Y. The company states that the product is unusually effective in formulations subjected to severe temperatures and is partioularly suited for use as a heat stabilizer in opaque and rigid polyvinyl chloride compositions since its high reactive lead oxide content functions to eliminate hydrogen chloride released during heat degradation.

Stayrite 229 is also used for stabilizing chlorinated paraffins and as a curing agent for chlorosulfonated polyethylene.

Fungus-Resistant Tape

ADDITION of Resinite CT-69, a fungus-resistant vinyl insulating and protective tape, to its line of specification tubings and tapes for the aircraft and electronics industries has been announced by Resin Industries, Santa Barbara, Calif.

Resinite CT-69 tape is designed for use in connection with Resinite EP-69 fungus-resistant tubing in electrical harnesses. Both tubing and tape are formulated from the same vinyl materials, conforming to Specification MIL-I-7444, and are said give complete fungus protection to wiring assemblies. Lacing cord of the same material is also available.

Heavier Shower Curtains

HEAVY, 8-gage vinyl shower curtains are now being produced by Hygiene Shower Curtain Mfg. Co., 261 Fifth Ave., New York, N.Y., from Goodyear vinyl film. Noel Levine, vice president of Hygiene, states that the new 8-gage shower curtain is one of the first of that thickness on the market.

The shower curtain, which is boilable and soap-resistant, is available in three basic patterns, each in eight different color schemes. Matching bathroom window curtains will also be offered in the 8-gage vinyl film material.

EXPANSION

Emery Industries, Inc., 4300 Carew Tower, Cincinnati 2, Ohio, has started construction of a new $800,000 research center. Adjacent to the plant in Cincinnati, the new building will provide new and larger quarters for the Basic Research, Development, and Chemical Engineering Depts.

The two-story, L-shaped structure, occupying 30,000 sq. ft. of floor space, will house 28 individual laboratories in one wing with several application laboratories in the basement. Equipment in the latter rooms is designed to evaluate, on a plant scale, all of Emery's fatty acids, plasticizers, and textile oils in such end-use applications as plastics, rubber, textiles, soaps and detergents, cosmetics, molded products, alkyd resins, lube oils and greases, and metal working oils.

Completion of construction is expected in late 1954.

Du Pont will construct a $3 million laboratory at Wilmington, Del., in order for its Polychemicals Dept. to provide added sales and engineering services to customers in the plastics and other industries. The laboratory, which will occupy an area of 62,000 sq. ft., will have the most modern equipment available. Its facilities for providing engineering services will exceed those of the present laboratory at Arlington, N. J., which the new building will replace.

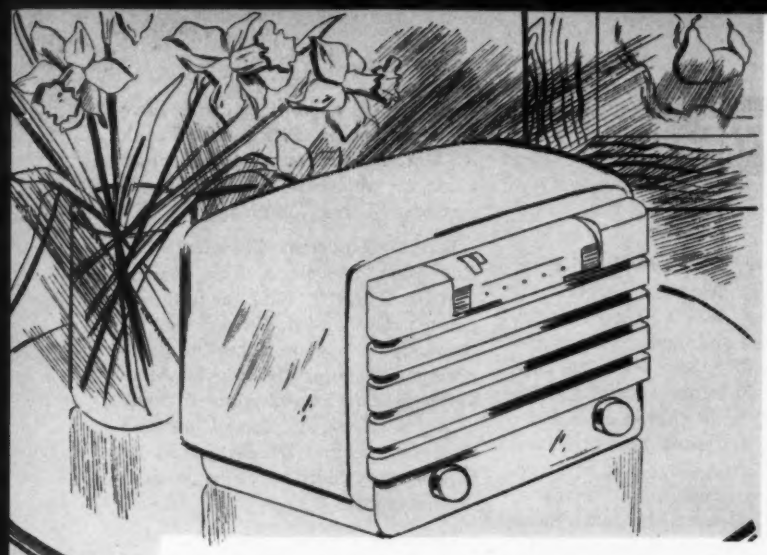
Parts of the new laboratory will be equipped especially for study courses on the utilization of plastics as new engineering materials. Space for exhibits of plastics materials and products will be provided in a two-story reception area. Large portions of the laboratory will be equipped for demonstrating new processing methods and for plastics testing and compounding. Members of the Polychemicals Dept.'s development and service section will have offices in the new building.

Preliminary work on the site is now under way and construction is expected to be completed in 1955.

Hercules Powder Co., Inc., Wilmington, Del., announces plans for the large-scale manufacture of the key material for one of the most promising of the new synthetic fibers. The company has started construction of a $4 million plant for the production of D.M.T. (dimethylterephthalate), the basic chemical used in the manufacture of Terylene, British trade name for the polyethylene terephthalate fiber developed in that country and known in the United States as Dacron. The plant is expected to be in operation by May 1955.

This is the second important new industrial field entered by Hercules within a year. Early in 1953 the company announced that it had started construction of an $8 million plant at Gibbstown, N. J.—which is well under way now—for the production of phenol and acetone. The new D.M.T. plant will be built on the site of Hercules' present synthetic resin facilities at Burlington, N. J., and will supply D.M.T. for the $22 million Terylene plant now being built by **Imperial Chemical Industries of Canada, Ltd.** at Millhaven, Ontario.

The Hercules plant will be the first to manufacture dimethyl terephthalate using a new air oxidation process. The only other D.M.T. plant in the United States utilizes a different manufacturing process. The Hercules plant will have an annual capac-



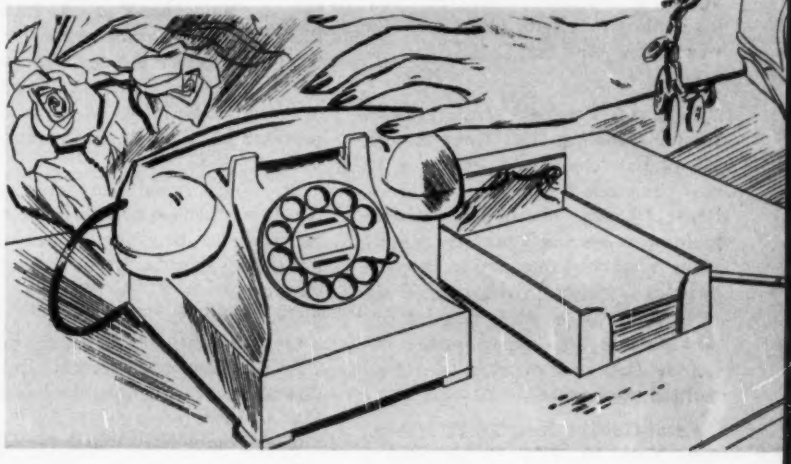
STEARATES *Aluminum, Sodium, Calcium, Magnesium, Lithium*—for "plastigels"... *Zinc, Calcium, Aluminum*—for internal lubrication, easier processing ... *Lead*—for heat stabilization, lubrication ... *Cadmium*—heat and light stabilizer for transparent formulations ... *Barium*—high temperature stabilizer ... *Calcium*—stabilizer for nontoxic formulations.

STABILIZERS *Witco #90*—nontoxic, acceptable USDA for food-wrapping film ... *Witco #80*—high efficiency, liquid synergistic stabilizer, moderately priced ... *Witco #70*—excellent heat stability, good clarity, lubricity ... also *Stearates* for stabilization listed above.

CARBON BLACKS Low specific gravity makes high loadings possible, with substantial reinforcement of modulus and tensile strength. Give jet-black color.

PLASTICIZERS
Butyl Stearate
Butyl Oleate
Dibutyl Phthalate
Dioctyl Phthalate

WITCARB® (precipitated calcium carbonate) Ultra-fine white extender and reinforcing agent for vinyl and other plastics. Available in three grades: Witcarb Regular (0.10—0.35 microns), Witcarb P (0.045—0.055 microns), Witcarb R (0.033—0.040 microns).



5 Witco Chemicals to aid plastics manufacturers

Made in Witco's Own Plants Under Strict Chemical Control Backed by Extensive Research and Technical Service Facilities

WITCO CHEMICAL CO.
CONTINENTAL CARBON CO.
260 Madison Avenue, New York 16, N. Y.

Boston • Chicago • Cleveland • Akron
San Francisco • Houston • Los Angeles
London and Manchester, England

ity of about 12 million lb. and will be designed so that this capacity can be increased as other markets for D.M.T. are developed.

Hercules officials state that as research and market development plans progress, they expect substantial demands for D.M.T. for uses other than synthetic fibers.

Officials of Imperial Chemical Industries of Canada, Ltd. estimate that its Terylene plant will be in operation about June 1955. Dimethyl terephthalate now being produced in semi-plant facilities at Burlington, N. J., will supply the Canadian pilot plant until the new Hercules plant is in full operation.

Hercules officials also point out that the company would continue a research and development program on dimethyl isophthalate. This chemical, which offers advantages in the preparation of plasticizers, alkyds, and polymers, will be made available when semi-plant facilities now being used for D.M.T. are released.

Fabricon Products, Inc., Plastics Custom Molding Div., River Rouge, Mich., has completed its move to new, expanded quarters within its River Rouge plants. Up-to-date molding presses and preform equipment have been installed in the new structure, which provides 18,000 sq. ft. of floor space. Also included are departments for experimental research and new product development departments.

Saint-Gobain, Inc., 500 Fifth Ave., New York 36, N. Y., is planning a substantial expansion of its plant in Chauny (Aisne), France, to meet the growing demand of French industry for maleic acid and anhydride.

Saint-Gobain is one of the largest manufacturers of chemicals and glass in Europe.

COMPANY NOTES

Monsanto Chemical Co.'s Plastics Div., Springfield, Mass., announces that **Reid G. Fordyce** has been promoted to the newly created post of director of development and technical service and **Eli Haddad** and **Ivan V. Wilson,** to assistant directors of technical service. Mr. Fordyce will head product and market development and will render technical assistance in customer servicing. Mr. Haddad will be in charge of technical service activities covering the groups for Ultron vinyl film, Resinox thermosetting molding materials, Lustrex styrene molding materials, Saflex vinyl butyral, and polyethylene products. Mr. Wilson will be responsible for product areas covering Opalon vinyl resins and compounds, Resinox and Resimene industrial resins, Lauxein and Lauxite adhesives, Vuepak cellulose acetate and sheet materials, as well as surface coatings.

St. Regis Paper Co., 230 Park Ave., New York 17, N. Y., has changed the name of its plastics subsidiary, Cambridge Molded Plastics Co., to **Cambridge-Panelyte Molded Plastics Co.** Cambridge will continue to operate under the same management, with the **St. Regis Panelyte** organization acting as exclusive sales representatives for the company's output.

St. Regis also announces that **Keith V. Swonsen** has been named manager of St. Regis Decorative Panelyte Manufacturer Sales. He will report to **C. L. Walters,** vice president of **St. Regis Sales Corp.,** sales subsidiary of St. Regis Paper Co. Mr. Swonsen, former Detroit district manager, joined the Panelyte Div. in 1948.

The company's Panelyte Div.'s Kalamazoo and Detroit, Mich., sales offices have been consolidated. **Paul Elzey** has been transferred from Kalamazoo to Detroit to become district manager of the combined offices.

Koppers Co., Inc., Pittsburgh 19, Pa., has made the following appointments: **B. R. Sarchet,** former manager of the company's Kobuta, Pa., chemical plant, has been named assistant sales manager of the Chemical Div. He succeeds **John W. Pool, Jr.,** who has been appointed manager of the sales development section of Koppers' Central Staff Sales Dept. Both appointees will have headquarters in Pittsburgh. **Frank R. Garner,** former assistant plant manager, replaces Mr. Sarchet as manager of the Kobuta plant.

B. F. Goodrich Chemical Co., Rose Bldg., Cleveland, Ohio, reports that **Dr. Robert J. Wolf** has been appointed director of development of the company's Avon Lake, Ohio, experimental station. **Claude H. Alexander** is now coordinator of technical service at the Cleveland headquarters and **Dr. Benjamin M. G. Zwicker,** coordinator of product development.

Hercules Powder Co., Inc., Wilmington, Del., has appointed **David S. Bruce** to the newly created post of director of operations of the Cellulose Products Dept. Mr. Bruce joined Hercules at its Explosives Dept. plant, Hercules, Calif., in 1936 and has been manager of new product promotion of the Cellulose Products Dept. since January 1952.

Catalin Corp. of America, 1 Park Ave., New York 16, N. Y., announces the election of **William J. Miller** and **Kendal L. Briggs** as vice presidents. Mr. Miller will be in charge of engineering of the company's plants at Fords, N. J., Calumet, Ill., and Thomasville, N. C. He was formerly associated with the **Barrett Div. of Allied Chemical & Dye Corp.** Mr. Briggs will be in charge of production of Catalin's three plants. He was formerly general plant manager of the company's Fords plant.

Rubber Corp of America, 274 Ten Eyck St., Brooklyn 6, N. Y., has opened a sales office at the Little Bldg., 80 Boylston St., Boston 16, Mass. **Cornelius T. Lyons,** who has been sales representative in the New England states for the company's line of plasticizers, plastisols, and latex compounds, will be in charge of the office.

Manufacturing Chemists' Association, Inc., is now located at the Cafritz Bldg., 1625 Eye St., N. W., Washington, D. C. The association made the move to make room for expanded activities and the centralization of activities formerly handled in New York.

M.C.A. also announces that **Cleveland Lane,** formerly manager of public relations of Pennsylvania Salt Mfg. Co., Philadelphia, Pa., has been named assistant to the presi-

Who are you ?

We are BEE Mold and Die, Inc. of Phoenix, Arizona. We're in Phoenix because it is the heart of a skilled labor market—one of the few places left where you can find the old-time craftsman, the man who takes pride in his work on a job well done, who will bend his skills to the intricate work that **you** demand from us. We are equipped with the most modern and up-to-date tools and machinery available. And we're ready to do a perfect and exacting job for you.

What do you do ?

We custom-manufacture molds and dies for the rubber, plastics and metal casting industries. We devote our entire effort to this single objective. We help relieve your production bottlenecks by supplying you with the molds and dies you need—as fast as a perfect job can be turned out—and as economically as possible. The quality and precision of the tools we make are guaranteed. We deliver **F.O.B. your plant.**

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We welcome the opportunity to quote on your needs in molds and dies.

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dent of the association. While at Pennsalt, Mr. Lane served on the Public Relations Advisory Committee of M.C.A. for several years and had recently been on loan as acting director of M.C.A.'s public relations program.

Phen-O-Tron, Inc., 455 Main St., New Rochelle, N. Y., announces the appointment of **Richard D. Schotter** as vice president and **Jack Bayha** as chief engineer of the company's new printed circuit plant. Mr. Schotter is well known in the field of phenolic fabrication. Mr. Bayha was formerly senior engineer of Emerson Radio & Phonograph Corp.

Phen-O-Tron's new plant is devoted exclusively to the manufacture of printed circuits and baseplates of phenolic and other materials.

General Electric Co.'s Silicone Products Dept., Waterford, N. Y., has transferred its Technical Service Unit from its Engineering Section to the Marketing Section in an organizational move to bring custom engineering of silicone products closer to end-user needs. **John T. Castles** has been named manager of the Technical Service Unit.

The Technical Service Unit's primary responsibility is to assist customers in solving their technical problems and to compile and evaluate technical data on silicone products.

Dowding & Doll, Ltd., 346 Kensington High St., London W. 14, England, has appointed **Ralph B. Symons Associates, Inc.,** 3571 Main Rd., Tiverton, R. I., sole distributor for the United States of its line of fully automatic injection molding machines.

National Research Corp., 70 Memorial Dr., Cambridge, Mass., announces that all functions and departments of its Equipment Div. are now located at the division's manufacturing plant at 160 Charlemont St., Newton Highlands 61, Mass.

The Equipment Div. specializes in high vacuum equipment, including diffusion and mechanical vacuum pumps, vacuum gages, coaters, furnaces, and other high-vacuum process equipment. The division has recently introduced the N.R.C. Mix-and-Settle Extractor, a versatile extraction device. It is also prepared to design, engineer, and construct complete vacuum-process plants.

General Electric Co., Pittsfield, Mass., has named **Roy W. Hill** and **John B. Hinds, Jr.** sales representatives of phenolic products in Chicago, Ill., for the company's Chemical Materials Dept. They will report to **E. M. Irish,** manager of G-E's Chemical Materials Dept. in Pittsfield.

S & W Moulding Co., Parsons and Reinhard Ave., Columbus, Ohio, has appointed **Peaslee-Gaulbert Corp.,** 1401 Stadium Dr., Indianapolis, Ind., and **Coffin & Whimple, Inc.,** 142 Broad St., Bangor, Me., as distributors of S & W's Miraplas wall tile.

Firestone Plastics Co., Pottstown, Pa., has named **Charles F. Edelmann** sales manager of the newly consolidated film and sheeting divisions. Formerly sales manager of the Velon film division, Mr. Edelmann will now supervise sales of both sheeting and film. Mr. Edelmann will continue to make his headquarters at 307 Fifth Ave., New York, N. Y.

Tinius Olsen Testing Machine Co., Willow Grove, Pa., has appointed **Research Instrument Co.,** 12410 Triskett Rd., Cleveland, Ohio, sales representative to handle Olsen's line of physical testing equipment in Ohio, with the exception of some counties adjacent to the Pittsburgh area.

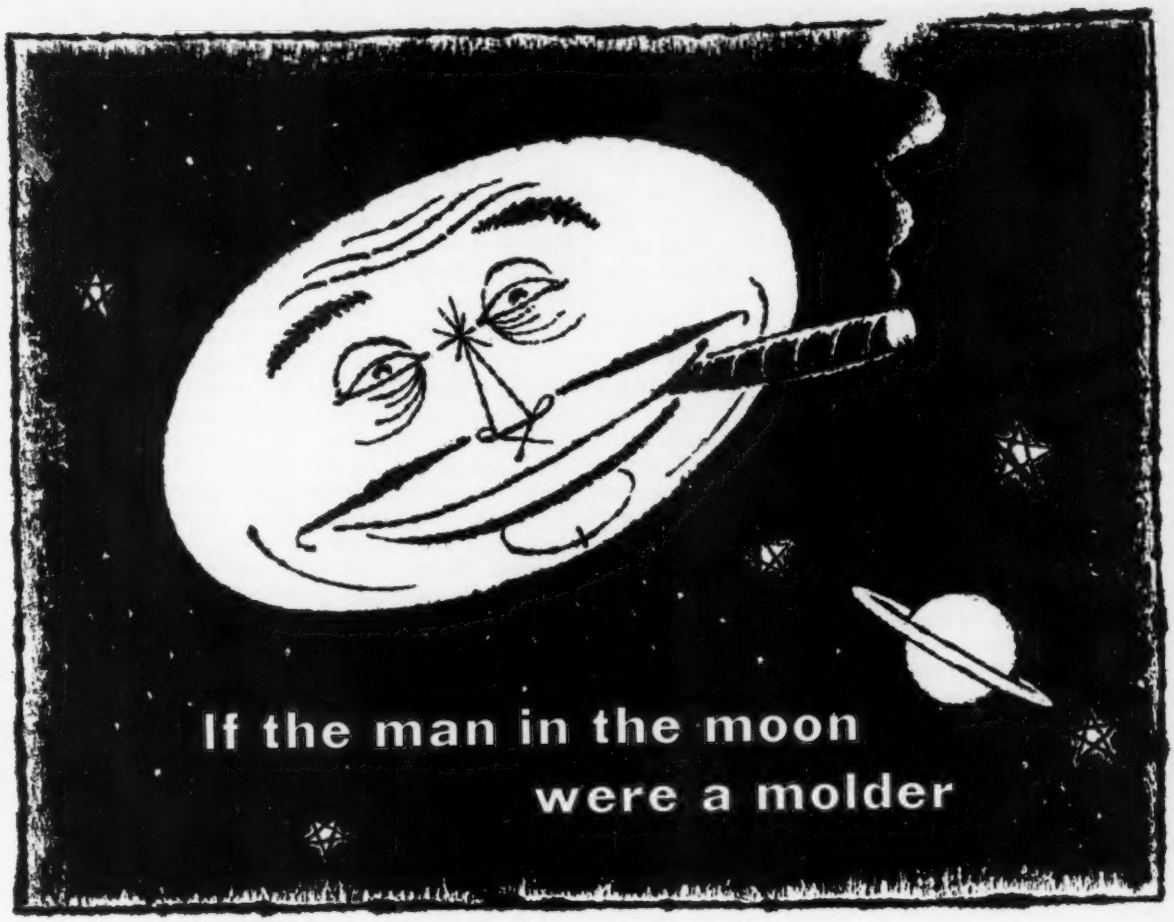
Textileather Corp., Toledo 3, Ohio, announces the following changes in personnel: **de Forrest Lott,** formerly vice president in charge of research at the company's plant, has been named vice president of development with headquarters in the company's executive offices in the Wayne Bldg. He has been with the company for 31 years. **John A. Weber,** who joined the company 20 years ago as a chemist, is now general production manager of both the Textileather and Toledo Dye Works Divs. **Edward G. Hamway** succeeds Mr. Lott as director of research and **Charles R. Mayer** has been appointed chief administrative engineer. **William E. Owen,** product manager of the company in Toledo, has been appointed assistant district manager of the New York office at 108 E. 18th St. He will assist **A. G. Morgan, Jr.,** manager of the New York area. **Lawrence F. Ryan, Jr.** succeeds Mr. Owen as product manager, with **John Reilly** as his assistant. **L. W. Mara** is now assistant product manager of furniture and allied fields.

The Visking Corp., 65th St. and Oak Park Ave., Chicago, Ill., has made the following appointments: **Gustav Freund II** has been named vice president and treasurer, succeeding **Howard Medici,** who is now executive vice president. Mr. Freund was formerly vice president, assistant secretary, and general manager of the company's Clearing Div., Chicago, Ill. **Alfred G. Hewitt,** former vice president and general manager of the Little Rock Div., N. Little Rock, Ark., has been appointed vice president and general manager of the Clearing Div. **Leslie E. Houck,** former assistant general manager of the Clearing Div., has become general manager of **Visking, Ltd.,** Lindsay, Ont. **Roland G. Maus** has been promoted to general manager of the Little Rock Div.

Witco Chemical Co., 260 Madison Ave., New York 16, N. Y., announces that **Dr. Edward F. Wagner** has been named manager of its Chicago plant. He will continue to serve as director of the Technical Service Dept. **Dr. W. B. Pings** is now assistant director of Technical Service, also retaining his post as director of the plant laboratory. **John V. Roach** continues as plant superintendent.

The Dow Chemical Co., Midland, Mich., reports that **Howard F. Schnepp,** formerly of the Detroit office, has been transferred to the molding powders section of the Plastics Sales Dept. at Midland. **F. V. Duffy** replaces Mr. Schnepp at the Detroit office. **F. C. Sullivan** has joined Dow's Minneapolis, Minn., office as a coatings salesman.

The Plas-Tex Corp., 2525 Military Ave., Los Angeles, 64, Calif., has appointed two new sales representatives as follows. **T. J. Riley & Associates,** Detroit, Mich., will handle the Plas-Tex line in Michigan and in Toledo, Ohio. **Ryan & Goefft,** Cin-



If the man in the moon were a molder,
And you were a client of his,
We'd say to you, "Come to earth, sir,
And give us a shot at your biz."

We'll supply you with service that's splendid,
As fine, we bet, as you've seen,
And we have a really nice factory,
It's modern, efficient and clean.

Questions? We'll ask them aplenty,
About what your moldings should do,
And when we have all the answers,
We can start in prescribing for you.

We'll tell you in how many cavities,
't will cost you least dough to mold.
Then we'll select a material,
That won't fail you, or make you grow old.

Deliveries? You'll get them on time, sir,
No need to get in a tiz,
We ship your stuff when you want it,
That's half of the fun that there is.

There's no need to commute to the moon, sir,
That's a fact of which we're quite pos,
Boonton's the molder on earth you can count on,
If e'er such a molder there was.

BOONTON MOLDING CO.

BOONTON, NEW JERSEY

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cinnati, Ohio, will cover Indiana, southern Ohio, Kentucky, and West Virginia.

Ferro Corp.'s Fiber Glass Div., 200 Woodycrest Ave., Nashville 20, Tenn., has named **The J. P. Schwebel Co.,** 424 Madison Ave., New York 17, N. Y., as exclusive East Coast sales representative to handle Ferro's Uniformat reinforcing products. Schwebel weaves and markets a complete line of fibrous glass industrial fabrics.

Reichhold Chemicals, Inc., 525 N. Broadway, White Plains, N. Y., announces that **Herbert W. Mason, Jr.** has been appointed to the newly created post of administrative vice president. Mr. Mason joined the organization in 1936 and has served in the Technical Service, Traffic, and Production Depts.

Resin Industries, Santa Barbara, Calif., has named **Ridley Associates,** 1551 N. Austin Blvd., Chicago 51, Ill., as exclusive factory representative of its Aircraft, Electronic, and Industrial Extruded Products Div. Ridley will handle the greater Chicago area, including the surrounding portions of Illinois, Iowa, Wisconsin, and Indiana.

Lodge & Shipley Co., Elam and Colerain Ave., Cincinnati, Ohio, has acquired through merger **The Columbia Machinery & Engineering Corp.,** Hamilton, Ohio. Columbia, established in 1942, manufactures power squaring shears, power press brakes, metal forming presses for the metal working industry, and hydraulic presses for the plastics, woodworking, and fiber industries.

Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, Ohio, has established two new divisions—Chlorinated Products Div. and Plastics Div. Each division will operate autonomously, assuming all sales, research, and plant manufacturing responsibilities under the direction of division general managers at the company's headquarters. **A. L. Geisinger,** vice president, associated with Diamond's activities in the organic chemicals field for the past three years, will be general manager of the new Plastics Div. The former Plastics and Agricultural Chemicals Div. has been liquidated.

The Plastics Div. absorbs all functions in connection with the $2 million polyvinyl chloride manufacturing facilities recently put into operation.

Texas Plastic Development Corp. is a newly formed company specializing in irrigation tubing, corrosion resistant coatings, and boat covering materials primarily for the Gulf states and the West Coast. Executive offices are located at 3638 University Blvd., Houston, Texas, and the plant at Trinity, Texas, where special equipment for the manufacture of vinyl and polyester impregnated fibrous glass products has been installed.

Officers of the company are: **Pete McNee,** president; **Paul W. Kollar,** vice president in charge of development and production; and **C. J. Gerker,** vice president in charge of sales.

H. Muehlstein & Co., Inc., 60 E. 42nd St., New York 17, N. Y., supplier of raw materials to the plastics and rubber industries, has announced completion of a plan which enables a group of 24, including officers, branch managers, and key personnel of the company, to purchase a substantial portion of the firm's stock. **Herman Muehlstein,** founder and president, states that the plan was put into effect to insure the continuance and perpetuation of the business and the policies of its present management.

Organized in 1911 with only a few employees, the company has since expanded internationally and now exceeds $50 million in annual business, with branch offices, plants, and warehouses in seven American cities and in London, England.

The Carborundum Co., Niagara Falls, N. Y., announces that **W. J. Ulrich,** senior sales representative for the Detroit, Mich., area, has been elected vice president of the company. He will continue his sales activities in the Detroit area but will report to the vice president of sales at Niagara Falls. **F. W. Bonacker** has been elected assistant vice president in charge of sales of Carborundum's Bonded Products and Grain Div. at Niagara Falls. **W. J. Kingsley** has been appointed sales manager of industrial product lines of the division and **J. G. Fritzinger,** sales manager of special accounts.

Irvington Varnish & Insulator, Div. of Minnesota Mining & Mfg. Co., 6 Argyle Terrace, Irvington 11, N. J., has changed the name of its Fibron Div. to Plastics Div. Company officials state that the new name will be much more descriptive of the division's activities, which now include production of extruded shapes for a wide variety of industries, products for the medical, chemical, and beverage industries, flat polyethylene tubing and sheeting for packaging applications, as well as a wide range of custom extrusions.

PERSONAL

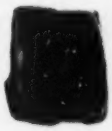
Roy H. Cunningham, sales manager of **Bryant Electric Co.'s Hemco Plastics Div.,** Bridgeport 2, Conn., has retired after 27 years in the plastics industry, 26 of which were with Bryant. Mr. Cunningham is a member of Plastics Pioneers and is known to almost everyone in the plastics molding industry. Among his many accomplishments were the early development of urea dishware and the subsequent molding of melamine dishware, which his company produced for the United States Navy during World War II.

His successor at Bryant is **Clyde Foster** who has been with the company for 35 years, the last seven of which have been served as manager of Bryant's Wiring Device Div. in Chicago, Ill.

E. H. Seim has been appointed plant manager of **Plywoods-Plastic Corp.,** Hampton, S. C., a subsidiary of **Westinghouse Electric Corp.**

Virgil E. Hellrung has been elected treasurer-controller of **American Insulator Corp.,** New Freedom, Pa.

Dr. Frederick W. Adams has been named director of research and development of the **Millsplastic Div. of Continental Can Co., Inc.** He will make his headquarters at the company's Research Div. in Chicago, Ill.

OVEN STABILITY AT 450°F*	0 MINUTES	10 MINUTES	20 MINUTES	30 MINUTES	40 MINUTES
Paraplex G-62—0% Dioctyl Phthalate—100%					
Paraplex G-62—25% Dioctyl Phthalate—75%					
Paraplex G-62—50% Dioctyl Phthalate—50%					
Paraplex G-62—100% Dioctyl Phthalate—0%					

STABILITY TESTS AT 450°F ON VINYL FILM PROVE VALUE OF PARAPLEX G-62 PLASTICIZER

PARAPLEX G-60, PARAPLEX G-62, and MONOPLEX S-71 for:

. . . Fast calendering
. . . Long-term durability
. . . Low stabilization costs
. . . Uniform color

The stabilizing effect of PARAPLEX G-62 in vinyl compounds is dramatically shown by the test samples above. PARAPLEX G-60 and MONOPLEX S-71 give similar results. Tests of durability, including Fade-Ometer, Weather-Ometer, and outdoor exposure, also demonstrate the ability of these plasticizer-stabilizers to impart resistance to embrittlement and discoloration.

In addition to their stabilizing effect, here are other key advantages of these Rohm & Haas plasticizers:

PARAPLEX G-60—polymeric-type, low volatility, good plasticizing efficiency, resistance to extraction by soap and water.

PARAPLEX G-62—polymeric-type, low volatility, low migration, excellent resistance to extraction by soapy water, oil and gasoline.

MONOPLEX S-71—monomeric-type, flexibility at low temperature, high plasticizing efficiency, lower volatility than conventional monomeric plasticizers.

*Tests based on this vinyl formulation:

Vinyl resin	100 parts
Plasticizer	54 parts
Cadmium-Barium Stabilizer	1.5 parts

MONOPLEX and PARAPLEX are trade-marks, Reg. U. S. Pat. Off. and in principal foreign countries.

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

THE RESINOUS PRODUCTS DIVISION

Washington Square, Philadelphia 5, Pa.

Representatives in principal foreign countries

THE PLASTISCOPE

Dr. Adams was formerly affiliated with Spool Cotton Co. as research director and with **Pittsburgh Plate Glass Co.** He was also an instructor of chemical engineering at M.I.T.

Valentine Boise has joined **General Dyestuff Corp.**, 435 Hudson St., New York 14, N. Y., as market manager of industrial dyestuffs. Mr. Boise will assist in the development work on dyestuffs in the paint, varnish, ink, and plastics fields and on the applications of pigments for textiles.

Paul A. Erskine has been appointed West Coast manager of the **Industrial Products Div. of Hess, Goldsmith & Co., Inc.**, 3049 E. 12th St., Los Angeles, Calif. Mr. Erskine was formerly textile specialist of **Owens-Corning Fiberglas Corp.**, Los Angeles.

Robert F. Gager is now director of research of **Snyder Chemical Corp.**, Bethel, Conn. His previous connections were with the **Electrochemicals Div. of Du Pont** and with **Varcum Chemical Corp.**

Thomas J. Herman has joined the sales staff of **Givaudan-Delawanna, Inc.**, and its associate companies, **Givaudan Flavors, Inc.** and **Sindar Corp.**, 330 W. 42nd St., New York 36, N. Y. Mr. Herman will service accounts in the territory covered by the company's Cincinnati, Ohio branch office.

George E. Baer is now manager of the New York office of **Waterbury Companies, Inc.**, 17 E. 42nd St., New York 17, N. Y.

C. N. Cahill has been appointed vice president of **J. B. Carroll Co.**, 319 W. Albany Ave., Chicago 12, Ill. Mr. Cahill was formerly vice president and general sales manager of **Gits Molding Corp.** for 13 years.

John E. Hunt has joined **Kimball Mfg. Corp.**, 1270 Pennsylvania Ave., San Francisco 7, Calif. The company specializes in the production molding of fibrous glass.

Robert H. Hessel has been appointed chief research engineer of **Davidson-Kennedy Co.**, 1092 Jefferson St., Atlanta, Ga. The company manufactures a low-pressure plastics molding press for the industry.

Dr. Hans W. Albu has joined the Product Development Dept. of **Permacel Tape Corp.**, New Brunswick, N. J. Dr. Albu was formerly technical director of Ross & Roberts Co.

Robert C. Fontham is now Midwest sales representative of **Fabricon Products, Inc.**, River Rouge, Mich. He was formerly affiliated with Neostyle, Inc.

Dr. H. H. Lebach has retired from **Haveg Corp.**, Marshallton, Del., after 50 years of active research work in the plastics field. Dr. Lebach, independent of Dr. Baekeland, is reported to have discovered thermosetting phenolic resins while working in Ludwigshafen, Germany, in 1906.

E. P. Additon has been named sales engineer of **Blaw-Knox Co.'s Chemical Plants Div.**, Farmers Bank Bldg., Pittsburgh, Pa., to cover the Mid-Atlantic states. Mr. Additon will have headquarters at the Philadelphia office.

Thomas J. Craig has been appointed technical director of **Sun Chemical Corp.**, Sun Chemical Bldg., Long Island City 1, N. Y., and its subsidiaries, and vice president of Sun's subsidiary, **Michigan Research Laboratories, Inc.** Mr. Craig joined the organization in 1944 and since 1945 has served as general manager of the corporation's E. J. Kelly Ink Div.

H. Rowell Conklin has been appointed manager of the Milwaukee, Wis., office of **Continental-Diamond Fibre Co.**, Newark 29, Del. He succeeds the late Walter R. Clarke, who had been with the company for 27 years.

Irene Dennery has been named advertising and sales promotion manager of **Nopco Chemical Co.**, Harrison, N. J.

Maurice Rifkin has been promoted to Eastern sales manager of **Revell, Inc.**, Venice, Calif. In addition to covering his own territory in metropolitan New York and northern New Jersey, Mr. Rifkin will now supervise the company's entire operation in the East from its new office and showroom at 200 Fifth Ave., New York, N. Y.

Arthur Paul Dowling has joined the Armour Research Foundation of **Illinois Institute of Technology**, Chicago, Ill., as a plastics research chemist. He has been assigned to the plastics and rubber section of the Foundation's chemistry and chemical engineering department. Mr. Dowling was formerly technical director of Rock Island Millwork Co., Rock Island, Ill., an engineer at the Naval Air Materials Center, Philadelphia, Pa., and a chemist at **Durez Plastics & Chemicals, Inc.**, N. Tonawanda, N. Y.

Deceased

Charles Almy who, in 1919, with Bradley Dewey, founded Dewey & Almy Chemical Co., Cambridge 40, Mass., died on Jan. 22, 1954 at the age of 65. Mr. Almy had resigned from the company as executive vice president in 1948 but remained as a consultant until December 1953.

MEETINGS

April 3-4—Packaging Machinery Manufacturers Institute, Spring Meeting, Hotel Dennis, Atlantic City, N. J.

April 5-8—American Management Association, Twenty-third National Packaging Exposition and Conference, Convention Hall, Atlantic City, N. J.

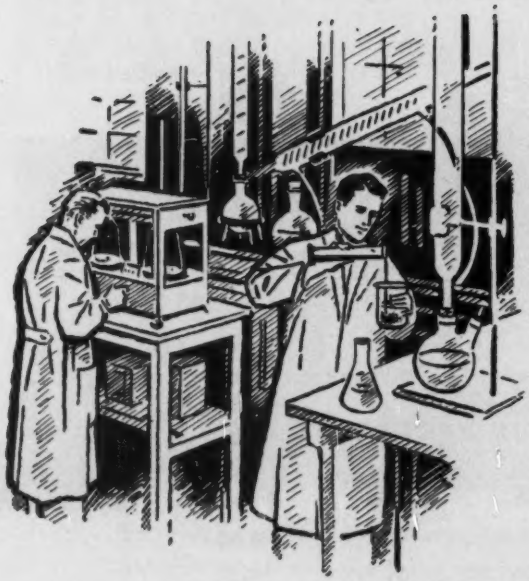
April 14-16—Society for Experimental Stress Analysis, Spring Meeting, Educational Lecture, and Exhibit, Netherlands Plaza Hotel, Cincinnati, Ohio.

April 26-30—American Society of Tool Engineers, Tenth Biennial Industrial Exposition, Convention Center, Philadelphia, Pa.

April 27—Association of Consulting Chemists and Chemical Engineers, Inc., Symposium and Banquet, Hotel Belmont Plaza, New York, N. Y.

May 17-20—Second Basic Materials Exposition and Conference, International Amphitheatre, Chicago, Ill.

HEYDEN FOR HEXAMINE



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Other users prefer the shorter name Hexamine. Whatever your favorite name may be - - and there are many others - - you can depend on Heyden "Hexa" for top quality and uniformity. As a prime producer of both the pharmaceutical and industrial grades in large volume, Heyden has the "know-how" to meet your most exacting requirements.

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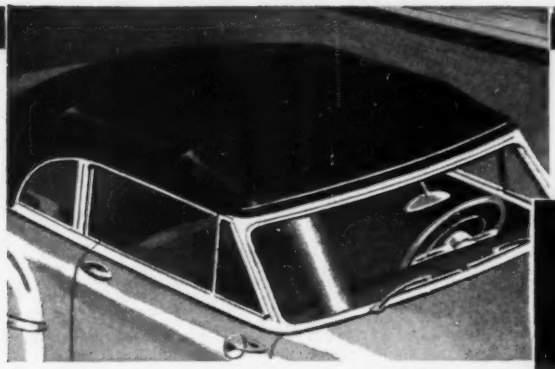

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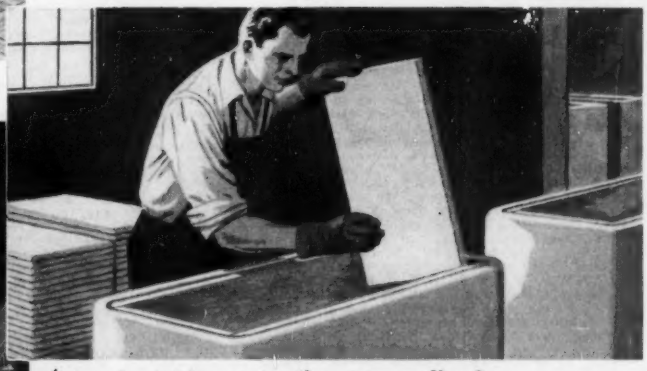

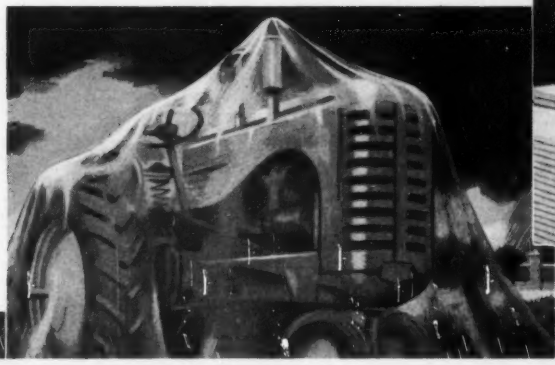

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EMPLOYMENT • BUSINESS OPPORTUNITIES • EQUIPMENT (used or resale only)

MACHINERY and EQUIPMENT FOR SALE

HYDRAULIC PRESSES: 1—Erie Belt Press, 4242 Tons, 2—8" openings, 18' 0"x52" Steel Steam Platens, 6 rams—30" dia.x16" stroke. 1—Birdsboro, 2000 Tons, down-acting ram 34" dia.x14" stroke, 48" DLO, 42"x42" bcd area. 1—Clearing, 500/1500 Tons, completely self-contained with controls for manual or automatic operation, suitable for compression and injection molding. 1—Farrell, 393 Tons, 48"x 48" steam platens, 2—15" openings, 4 rams 10" dia.x24" stroke, approx. 15" per opening. 1—Watson-Stillman, 100 Tons, down-acting ram 11½"x9½"x6" stroke, 22"x26" bed, 24" DLO, self-contained, 15 HP MD Vickers Pump. Unit PRACTICALLY NEW. 1—Watson-Stillman, 100 Tons, 11¾"x12" platens, 22½" DLO, ram—8" dia.x15" stroke, complete with 3 HP MD Pump. 1—HPM, 100 Tons, 18"x18" Platen Area, ram—8" dia. x 18" stroke, 30" DLO, Steel Cylinder—4000 PSI. 2—Burroughs, 75 Tons, down-acting, 17½"x17" electric-heated platens, 13½" DLO, ram—8" dia. x 10" stroke, complete with 7½ HP MD Oilgear Pump. 1—HPM, 35 Tons, down-acting ram 6" dia. x 6" stroke, 15" DLO, 12"x6" bed area, self-contained. 1—Induco Laboratory Press, 12 Tons, Hand Operated, 8"x8" electrically heated platens. NEW. INJECTION MOLDING MACHINES: 1—Plasticor Vertical 2 oz. Electric Heated, Hand Operated; 1—HPM Horizontal Model 54, 2 oz., 22 Ton Clamp, 12 Ton Injection, Manual Control, Oil Heated. Also: Plastics & Rubber Extruders, Mills, Mixers, Grinders, Injection Molding Machines, Pumps, Valves, Platens, etc. JOHNSON MACHINERY COMPANY, 683 Frelinghuysen Avenue, Newark 5, New Jersey. Tel.: Bigelow 8-2500. What have you for sale? What are you looking for?

FOR SALE: Rubber and Plastic Equipment. Farrell 16" x 48", 15" x 36" and 6" x 12", 2 roll rubber mills. Other sizes up to 84". New Seco 6" x 12" and 6" x 16" Lab. Mixing Mills and Calenders. Rubber & Plastic Extruders. Stokes #280, 4" diam. Preform Machine. HPM 200 ton 30" x 54" Platens. 350 ton 22" x 24". New Loomis 340 ton, 24" x 56" platens. Southwark 325 ton, 42" x 24" platens. Adamson 200 ton. 24" x 24" platens. 200 ton Brunswick 21" x 21" Platens, 14" Ram, Record Presses. 100 ton 24" x 24". Elmes 75 ton 30" x 36". Also presses Lab. to 2000 tons from 12" x 12" to 48" x 48". Hydr. Oil Pumps. Gould 75 HP motor Dr. 2 stage Centrif. Pump. 250# W.P. W.S. 4 Plgr. High and Low Pressure Hydr. Pump. HPM 5 GPM 2700 lbs. Elmes Hor. 4 Plgr. 4500 lbs. and 5500 lbs. Hydr. Accumulators. Stokes Automatic Molding Presses. Rotary & Single Punch Preform Tablet Machines ½" to 4". Injection Molding Machines 1 oz. to 32 oz. Baker Perkins Jacketed Mixers 100, 50, and 9 gal. Plastic Grinders. Heavy duty mixers, grinders, pulverizers, gas boilers, etc. Partial listing. We buy your surplus machinery. STEIN EQUIPMENT CO., 107-8th Street, Brooklyn 15, N.Y. STerling 8-1944.

FOR SALE: 1—F.B. 24"x84" Mill, w.e. bearings, red. drive, 240 HP a.c. motor; 1—F.B. 32"x92" inverted-L 4 Roll Calender, red. drive, d.c. vari-speed motor; 1—Royle No. 4 Extruder, M.D.; 1—F.B. 6"x13" self-contained 3 Roll Calender M.D.; 1—6"x12" Lab. Roller Mill; 1—Reed-Prentice 4 oz. Model 10A Injection Molding Machine; 1—No. 1 Banbery Mixer; 7—Dry Mixing Blenders up to 5,000 lbs.; 3—Micro Pulverizers; 2—Ball & Jewell Cutters; 1—Kux Model 50 Preform Machine; 1—Day Ro-Ball No. 71 S/S sifter. Also Grinders, Extruders, Pulverizers, Baker Perkins Mixers, Screens, Kettles, etc. Send us your inquiries. We buy your idle machinery. CONSOLIDATED PRODUCTS CO., INC., 50 Bloomfield Street, Hoboken, N. J. HOboken 3-4425. N. Y. Tel. BArclay 7-0600.

FOR SALE: Drum Machine for cutting table cloths, shower curtains, etc.—motorized—expands from 36" to 112"—equipped complete—$595.00 Used rolls 60 to 72" face. Chill Rolls, heating rolls, Rubber covered Plain rolls, idlers, and Baloney bars. Tensionless tubing machine to give you variations hard or soft rolls. T & M MACHINE & TOOL CO., 29 Greenpoint Avenue, Brooklyn 22, N. Y. Tel.: EVergreen 9-1964.

FOR SALE AT GREAT SAVINGS
Colton 2RP and 3RP Rotary and 4T Tablet Machines. Day 40x120 Single Deck Sifter. Great Western—all models. Mikro Bantam, 1SH, 2TH, 3W, 3TH, 4TH Pulverizers; Schutz O'Neill Mills. Baker Perkins Heavy Duty Steam Jacketed, double Arm from 12 to 150 gal. Mixers. (Unidor and Vacuum also) J. H. Day, from 4 up to 75 gal., Imperial and Cincinnatus, D. A. Jacketed, Sigma Blade Mixers. Day & Robison Dry Powder Mixers, 100 up to 10,000 lbs. Package Machy, FA, FA4, Miller Hayssen 3-7 Scandia auto, Wrappers. Hudson Sharp Campbell auto. Cellophane Wrapper.
REBUILT AND GUARANTEED—This is only a partial list. Over 5000 machines in stock—available for immediate delivery. Tell us your machinery requirements.
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FOR SALE: 60 ounce Jackson & Church, used 1 week, reasonable. 48 ounce Lester, 1950; 32 ounce Watson-Stillman, new; 32 ounce Reed-Prentice, new 1950; 24 ounce DeMattia; 22 ounce Impco vertical; 22 oz. Reed-Prentice, new 1948; 20 ounce Lester; 16 oz. Lester, 1946, $10,500; 16 oz. Reed-Prentice, new 1946; 16 oz. H.P.M., 1946, $15,000; 12 oz. Lester; 12 oz. Watson-Stillman, 1953; 8 oz. Lcominster, 1945, $5500; 8 oz. Reed-Prentice, 1951; 8 oz. Reed-Prentice, double link, $6000; 6 oz. Watson-Stillman, $3000; 6 ounce Lester, Model 1½L; 4 oz. Reed-Prentice, new 1945; 4 oz. Lester; 4 oz. Lewis, 1953, $5750; 4 oz. DeMattia, horizontal, $1500; 3 oz. Fellows, new; 2 oz. Fellows, 1951; 2 oz. Leominster, $2750; 2 oz. DeMattia, vert. hydraulic, $1000; 25 ton & 50 ton Watson-Stillman angle molding presses; Compression presses, 50 ton to 2000 ton, all types; G.E. Dielectric Preheater; vacuum plater 4' cap.; used scrap grinders, ovens; tumbling dry mixers, new, $315 each. ACME MACHINERY & MFG. CO., 102 Grove Street, Worcester, Mass.

SAVE WITH GUARANTEED REBUILT EQUIPMENT: 2 New R. D. Wood 500 ton EMBOSSING PRESSES: 54"x26" platen: HYDRAULIC PRESSES: 42"x37", 20" ram, 475 tons; 2-7 opening 27"x27", 18" ram, 565 tons; 24"x24" 12" ram, 170 tons; 24"x20" 10" ram, 118 tons; 20"x20" 10" ram, 118 tons; 20"x20" 10" ram, 200 tons; 30"x20" 8" ram, 75 tons; 24"x20" 8" ram, 75 tons; 14"x14" 6" ram, 75 tons; 15"x15" 8" ram, 75 tons; 2-19"x24" 10" rams, 78 tons; 12"x12" 6½" ram, 50 tons; 14"x14" 8" ram, 50 tons; 8"x 9½" 4½" ram, 20 tons; 16"x16" 3½" rams, 12 tons; PREFORM PRESS: Colton 5½T, Reeves Drive and Motor; LABORATORY PRESSES: Carver & Watson Stillman Units; NEW UNIVERSAL DUAL PUMPING UNITS: 3-15 HP; NEW LABORATORY MILLS, and CALENDERS; EXTRUDER: Modern Plastic 1½"; ACCUMULATOR; HPM 6" ram 2500#, also Mixers, Vulcanizers, Injection Molding Machines, etc. UNIVERSAL HYDRAULIC MACHINERY CO. INC., 285 Hudson Street, New York 13, N. Y.

CUT OUT DIE CUTTING PRESSES, REBUILT, ETC—as used in Vacuum Forming. We always carry in stock available for immediate shipment all sizes Seybold and Sheridan Die Cutting Presses. These Presses use either the High Steel Die or the Inexpensive Steel Rule Cutting Dies can cut from 1,000 and up per hour. Sheer Cutters 30" up to 72". Power Cutters all sizes 32" up to 65". Hand Lever Paper Cutters 23" to 30". Slitting Machinery—60" Style AA Langston. For any Cutting—Die Cutting—Slitting—Sheeting Machinery. BROOKLYN PRINTERS SUPPLY COMPANY, 110 South 8th St., Bklyn 11, N.Y. Tel.: EV 8-5737.

FOR SALE—LESTER INJECTION MOLDING MACHINES
One type 2-B-44-6 oz. with 8 oz. injection cylinder, extra large pump. One type 3-S-27-12 oz. with late type Lester internally heated injection cylinder. Both equipped with Ross cooler, Briggs clarifier and heat control instruments. Excellent condition. Can be seen in operation. Immediate delivery.
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AVAILABLE IMMEDIATELY AT CAMBRIDGE, OHIO: Elmes Low Pressure Sextuplet Pump Six Plunger, Serial 508175, Capacity 300 gal./min. at 500 lbs. PSI Crankshaft—speed 200 RPM, plunger—dia. 4⅜", equipped with 175 H.P. motor and acrossline starter. One (1) Union Steam Duplex Power Pump 3½ x 10, 55 gal./min. 550 PSI, equipped with 25 H.P. motor and acrossline starter. Two (2) Low Pressure Accumulator Tanks, 500 lbs. 80 gal. each, size 50½" x 12' complete with valves. All above equipment A-1 operating condition. Will be sold "as is, where is" basis. Contact A. W. Rohde, CONTINENTAL CAN COMPANY, INC., 100 East 42nd Street, New York 17, N.Y., 25th Floor, Telephone OXford 7-1200, Extension 384, for price and inspection information.

HYDRAULIC PRESSES rebuilt, repaired. Used presses from laboratory to 1000 tons standard and special, molding and hobbing presses, etc. Used pumping units up to 10,000 p.s.i. all capacities. CLIFTON HYDRAULIC PRESS CO., 291 Alwood Rd. P.O. Box 325, Clifton, New Jersey.

FOR SALE: POLYVINYL ACETATE UNIT, capacity 1000# per hour. Includes, 500 gal. s/s Reaction Kettle with Condensers and Xpl motor; 6' dia. x 15' long s/s, d.h. Rotary Resin Dryer; solid bowl type, all s/s Centrifuge, 30" x 40", m.d.; 3—s/s Tanks, 500 gal., 250 gal.; 3—s/s Pumps with Xpl motors. Equipment is NEW, entirely of 316 stainless. Priced at fraction of new cost. Drawings available. CONSOLIDATED PRODUCTS CO. INC., 50 Bloomfield Street, Hoboken, N.J. HOboken 3-4425. N. Y. Tel.: BArclay 7-0600.

WE HANDLE HYDRAULIC PRESSES, pumps and power units of all sizes. Write us your requirements and we will try to help you. We find it impossible to list our equipment in this classified column due to the fact that the equipment is sold before ad is published. For those who seek action look in the New York Times under the Machinery and Tool Column for our regular Sunday Special. HYDRAULIC SAL-PRESS, INC., 386-90 Warren Street, Brooklyn 2, N. Y. MAin 4-7847.

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MOLDCRAFT, INC.
1505 W. 41 Street, Baltimore 11, Md.

STOKES ROTARY PELLET PRESSES (5): 16-punch RD-3 and 15-punch RDS-3. (2) Kux model 25 Presses 21 and 25 punch. Ball & Jewell #1½ stainless steel rotary cutter. Mikro Pulverizers #1-SH, #1-SI, #2-TH, #2-SI & 24". Large stock steel and stainless tanks and kettles. PERRY EQUIPMENT CORP., 1429 N. 6th St., Philadelphia 22, Pa.

FOR SALE: Injection Presses: 4 oz., 8 oz., 24 oz. Reeds, 4 oz., 9 oz., 16 oz. HPM. 1 oz. VanDorn. Extruder: 1½" NRM. Scrapgrinders, Ovens. Lab Presses. Compression Presses: 450 tons, 100 tons. Pumps. Stokes Automatic 50 tons 235 A Press. 42" Slitt. & Rewind. mach. Complete Wire Coating & Drying Unit. 3 HP Gasboilers. Canister Mold. Birdcage Mold. List your surplus equipment with me. JUSTIN ZENNER, 823 Waveland Ave., Chicago 13, Ill.

FOR SALE: Electronic Quilting Machine 54" wide. Fully equipped and in operation. Can quilt light and heavy gauges. Reply Box 1526, Modern Plastics.

MACHINERY and EQUIPMENT WANTED

WANTED: Plant or Machinery including Rubber Mills, Hydraulic presses, Sturdy mixers, Calenders, Banbury mixers, Pulverizers, Grinders, Rotary cutters, Extruders, Screens, Injection Molding machines, Dryers. CONSOLIDATED PRODUCTS CO. INC., 50 Bloomfield Street, Hoboken, N.J. HOboken 3-4425. N.Y. Tel.: BArclay 7-0600.

(*Continued on page 228*)

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by ETHYLENE

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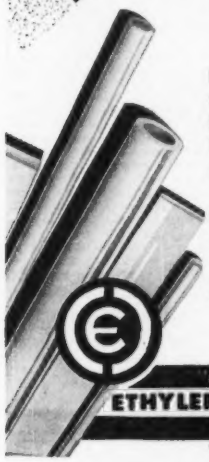

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Toledo 2, Ohio

Please send me your 8-page booklet on Vitron Glass Fiber Yarns.

Name _____
Company _____
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CLASSIFIED ADVERTISING

(Continued from page 226)

WANTED: 1 to 4 Van Dorn 2 ounce lever operated or semi-automatic injection presses; used, but must be in good condition. Please state age, condition, amount of usage, location, and price asked in first letter. Write: DEPARTMENT M, 111 S. Floyd St., Louisville 2, Ky.

WANTED
A Van Dorn H-200 Press. Write or call particulars.
A. N. STRIBLING
2610 Lincoln Ave. St. Albans, W. Virginia

A GOOD USED EXTRUDER—2½" to 4½" screw, electrically heated jacket and full electrical controls. Also PELLETIZER in conjunction with or separate from above machine. Give price and description your first letter. ERIE IRON & SUPPLY CORP., P.O. Box 1068, Erie, Pa.

WANTED: One Reinforced Plastic molding press fully automatic hydraulic, 50 ton or greater, 30" x 30" or greater bed, minimum open daylight 48" with 32" minimum stroke. Give price and full details in first letter. Reply Box 1505, Modern Plastics.

WANTED: Banbury Mixers, Heavy Duty mixers, Calenders, Rubber Rolls & Mixers, Extruders, Grinders & Cutters, Hydraulic Equipment, Rotary and Vacuum Shelf Dryers, Injection Molding Machines. Will consider an operating or shut down plant. P. O. Box 1351, Church Street, New York 8, N.Y.

WANTED: Injection Cylinder for Lester 3S-27-12 either 8 or 12 oz. capacity, internally heated. Must be reasonably good condition. Reply Box 1509, Modern Plastics.

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FOR SALE: 24,000 lbs. #620 Red Plaskon Urea. Hi-Gloss, fast cure. $.15/lb. f.o.b. Los Angeles warehouse. Reprocessed acetate; 9,800 lbs. Black; 20,719 lbs. Red; 4,236 lbs. Green; 6,950 lbs. Blue. Any reasonable offer will be considered. ELDON MFG. CO., 1010 E. 62 St., Los Angeles 1, Calif., Contact J. R. Taylor.

FOR SALE—Ivory Kodapak .015"—5½ rolls, Ivory Kodapak .015"—200 sheets, Red Polyflex .0075"—5 rolls, White rigid vinyl .013"—300 lbs. Attractive price. EMERSON PLASTICS CORP., 567 Third Ave., New York City. MUrray Hill 2-4333.

MATERIALS WANTED

WANTED: PLASTIC SCRAP OR REJECTS in any form. Also surplus and obsolete lots of virgin molding powders. We also custom reprocess your own scrap. A. BAMBERGER CORP., 703 Bedford Ave., Brooklyn 6, N. Y. Telephone: MAin 5-7450.

WE ARE ALWAYS IN THE MARKET FOR THERMOPLASTIC SCRAP AND REJECTS OF ALL KINDS. Also surplus or obsolete lots of reprocessed and virgin materials purchased. Highest prices paid. Custom grinding and compounding to your specifications. PLASTIC MATERIALS, INC., 589 Main Street, Westbury, L.I., N.Y. DIAL—WEstbury 7-7124.

WANTED: Plastic Scrap, Rigid Vinyl, Cellulose Acetate, Polystyrene, Polyethylene, Butyrate. Custom grinding, magnetizing, compounding, and straining of contaminated plastics. FRANKLIN JEFFREY CORPORATION, 2004 McDonald Avenue, Brooklyn, N. Y., ES 5-7943.

WANTED: PLASTIC SCRAP IN ANY FORM. Rejects—Nozzle Waste—Surplus Inventories, Obsolete Virgin Molding Powders—Acetate, Butyrate, Ethyl Cellulose, Hi Impact, Nylon, Polyethylene, Polystyrene, Vinyl, Acrylic. Highest Prices Paid. We also reclaim your scrap. Consult us for Reprocessing Charges. GERING PRODUCTS, INC., 7th St., Kenilworth, N.J. Cranford 6-2900.

POLYETHYLENE, all kinds, virgin and scrap. ROART CO., 830 Monroe St., Hoboken, N.J.

WANTED: One ton of colored plastic discs approx. 11/16" diameter, 1/16" thick. Prefer a punching scrap product. Low price is imperative. ADVERTISING SPECIALTY CO., 111 No. Virginia St., Reno, Nevada.

WANTED: PLEXIGLAS & LUCITE cut-offs, surplus sheets and rejects. Small or large quantities. ARISTOCRAT PLASTICS, INC., 55 Clarkson Street, New York 14, N. Y. W./e.kins 4-4216.

PURCHASING AGENTS
Liquidate Your Obsolete Inventories—Offer us your surplus and scrap: Rigid Vinyl, Styrene, Butyrate, Acetate.
CLAUDE P. BAMBERGER, INC.
152 Centre Street Brooklyn 31, N. Y.
Tel.: Main 5-5553
Not connected with any other firm of similar name.

MOLDS FOR SALE

FOR SALE: 1—4 cavity baby brush mould. 1—brush and mirror mould. 1—cover mould for miniature piano cigarette box. ROART CO., 830 Monroe St., Hoboken, N. J. HOboken 2-2020—2021.

MOLDS WANTED

WANTED: MOLDINGS AND OR DIES for Small Plastic Figures of Ducks, Swans, Birds, Animals of any description, Boats, Fish, Frogs. Approximate maximum dimensions 1¼ x 1¼ x 3". What can you offer for immediate shipment? Samples appreciated. KENTWORTH CORPORATION, 620 Main Street, Redwood City, Calif.

BRUSH MOLDS & BRUSH MACHINERY, injection molds for ladies, men's, military, nail, toothbrushes, etc. Send particulars & samples. Box 382, REALSERVICE, 110 West 34th St., New York, N. Y.

PLANTS FOR SALE

INDUSTRIAL BUILDING, Gastonia, N. C. 52,500 sq. ft., mill type construction, wired, sprinklered, steam heat railroad siding. Rental, $.25 sq. ft./yr. Also, other buildings listed. For information on rentals—sites—location data, write: GAS. IND. DIVERSIFICATION COMMISSION. Box 823 P, Gastonia, N. C.

IN LOS ANGELES, CALIFORNIA—Sheet Plastic Manufacturing Plant complete with Baker Perkins 5 Roll 16" x 40" calender, 2 Roll 16" x 40" Compounding Mill, Coating Machine, Embossing Machine, Conveyor with Infra-Red Lights, 25 H.P. Boiler, etc. Ready to operate or be moved. JERSAR PLASTICS CO., 649 Gladys Avenue, Los Angeles 21, California.

HELP WANTED

MANUFACTURER'S REPRESENTATIVE
We want capable manufacturer's representatives in Chicago and certain other territories to sell custom injection molded parts. We have an unusual arrangement to offer.
Write—ARENS CONTROLS, INC.
2017 Greenleaf Street, Evanston, Illinois

FOREMEN (4). Injection Molding. Top men only. Must be capable of full responsibility for production, quality, maintenance and personnel. Unusual opportunity to join a well integrated and growing, large Chicago molder. Replies also solicited from experienced set-up and maintenance men who know equipment and have supervisory capabilities. Reply in confidence to Company President. Salary open. Reply Box 1501, Modern Plastics.

PRODUCTION EXECUTIVE—PLASTICS. For small plastics manufacturing division of substantial company. Exceptional potential growth. Experience with injection and compression molding; manufacturing methods; tool and die design; and production planning. Location—Mid West. Submit personnel summary and salary desired in reply. Reply Box 1519, Modern Plastics.

CHEMICAL ENGINEER. Large Chicago manufacturer desires an experienced man to work on special plastic coating process. Knowledge of manufacturing Vinyl, Nylon or other plastic hose a definite asset. Must have background in extruding. Send full details, photo—all replies confidential. Reply Box 1521, Modern Plastics.

TECHNICAL SERVICE REPRESENTATIVE PLASTICS INDUSTRY
Major suppliers of thermoplastic sheets, films and molding compounds requires a field technical service man to age 35. Prefer graduate in engineering or physical sciences, but must have at least 2 years technical training at college level. Experience in plastics industry necessary with emphasis on conversion of film and fabrication of sheeting. Submit complete resume stating age, education, experience and salary requirements. BOX MP 645, 221 W. 41st St., N. Y. 36, N. Y.

DESIGNER—New England firm desires full time or part time industrial designer familiar with plastics both of industrial and commercial type. Excellent opportunity for the right man. Reply Box 1535, Modern Plastics.

VINYL CHEMICAL ENGINEER OR CHEMIST
Experienced on heavy or light gauge calendering. Real opportunity with progressive company.
Reply Box 1508, Modern Plastics.

SUBSTANTIAL COMPANY presently engaged in extrusion wants diversification and expansion through new products and techniques have need of sound man to direct compounding, cost reduction, and development of new items. Should be familiar with existing extrusion compounds, raw materials and extrusion techniques. Would consider polyethylene. Film and sheeting experience desirable along with treating, printing, sealing vacuum forming of extruded sheets, welding, and other fabrication techniques helpful. Salary commensurate with ability and experience. Give full experience in first letter. Reply Box 1530, Modern Plastics.

REINFORCED PLASTIC ENGINEER with experience in corrugated plastic sheets. Excellent opportunity with well rated company to get in on the ground floor of their rapidly expanding reinforced Plastics Division. Please send resume and salary expected to PLASTICS DIVISION, P.O. Box 5037, Zone 11, Philadelphia, Penn.

FIBERGLASS plant seeks superintendent, foreman, production manager. Must be experienced in fiberglass molding and layup. So. Cal. Reply Box 1515, Modern Plastics.

CONSULTANT WANTED to assist old established reliable manufacturer in appraising use of chemicals in plastics manufacture.
Reply Box 1529, Modern Plastics

NEED GOOD MAN to assume responsibility of full production management of existing good size going extrusion operation of progressive firm located in East. Should be capable of cost reduction mechanization increasing output and have diversified knowledge of techniques of compounding, extrusion of existing compounds including lay flat polyethylene. Future diversification would deem wire coating, vacuum forming piping and other specialties helpful, but not necessary. Degree desirable, but excellent practical man can fill position. Salary dependent upon experience and potentials. Reply Box 1534, Modern Plastics.

PLASTICS DEVELOPMENT Chemist or Engineer—Position open with leading resin manufacturer in the development of polyester resins. Age 25-35. Experience in thermoset resins preferred. New research center with advancement opportunities. Apply by letter giving background and personal information. Reply Box 1531, Modern Plastics.

POLYESTER DEVELOPMENT MAN
Excellent opportunity for young graduate engineer with experience in reinforced polyester resins. National firm in Southern Wisconsin establishing a new department. Salary open. Please state age and experience in reply.
Reply Box 1524, Modern Plastics.

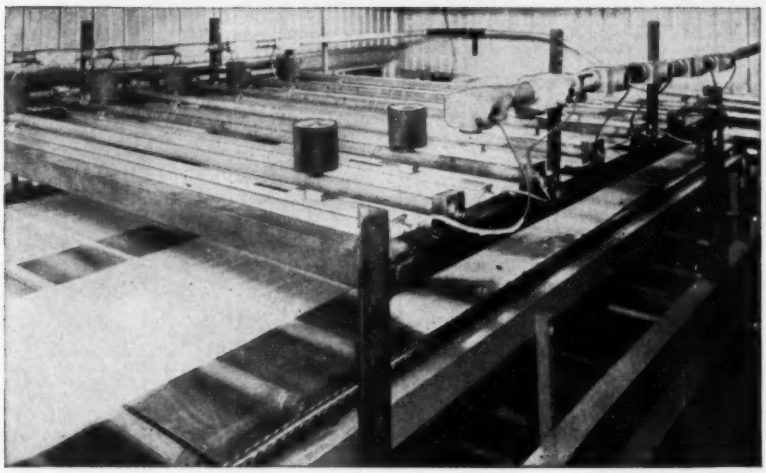
SALES ENGINEERS to represent old-established injection molder. Press capacity 4 to 200 ounces. Tool room, painting, silk screening, hot stamping—all conveyorized. Straightline assembly. Automatic packaging equipment. Prefer experienced men and men with industrial contacts. Also men controlling one or more special deals. Large midwest plant. Give complete details. Personal interview to follow. Reply Box 1500, Modern Plastics.

(Continued on page 230)

CHROMALOX

PROFITABLE IDEAS FOR PLASTIC PROCESSING

Production TIPS



VINYL SHEETS DEHYDRATED AT 22 FT. PER SECOND WITH CONVEYORIZED RADIANT HEATING SYSTEM

While heat, pressure and moisture are often combined in many processing operations, they are a bad team when it comes to laminating a sheet of vinyl between two sheets of glass to make safety glass. In fabricating safety glass the vinyl sheeting must be perfectly dry at the bonding stage to assure cleanness and clearness of the glass throughout its useful life.

That's where Chromalox Radiant Panels enter the picture!

After cleaning and rinsing the vinyl sheets, one large safety glass manufacturer found a ready solution to the problem of moisture by installing a bank of six Chromalox Radiant Heaters to remove excess moisture contents from the sheeting. The heaters were mounted on an angle iron frame above a conveyor belt travelling at 22 feet per minute. The radiant heaters spread an intense blanket of uniform heat across the width of the sheets to reduce moisture content to a very safe one-half of one per cent at the time of lamination.

Bonding failures due to moisture are now eliminated; and the high absorption of the far-infrared heat by the sheeting has increased the drying rate over the former and less efficient method. Too, the compact design of the Chromalox Radiant Heater installation saves floor space and is easily adapted to conveyorized production.

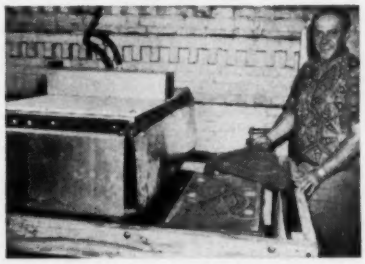
Chromalox Application Report No. R-121 covers this interesting application in detail. Send for it today. The report may suggest ways you can improve production and cut rejects in your own operations with Chromalox Radiant Heaters.

READY REFERENCE GUIDE

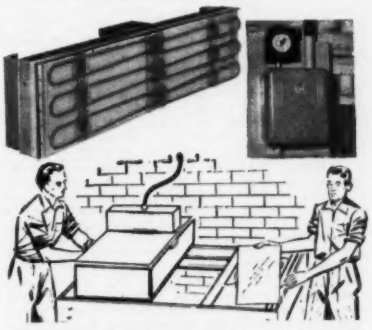
TO CHROMALOX APPLICATIONS IN PLASTICS PROCESSING

Here's a 24-page handbook that shows actual case studies of how Chromalox electric heaters of all types are cutting costs and increasing output in the plastics field. You'll find the handbook interesting and informative. And perhaps you'll also find a solution to a particularly perplexing heating problem now confronting you. Check coupon for your copy of application guide.

VACUUM FORMING FOR A SMALL INVESTMENT



For a relatively small outlay of capital, companies forming plastic sheets by the vacuum process can construct their own molding machines. The secret is in the Chromalox Radiant Panel which is the heating component of the equipment. Radiant panels provide far-infrared radiation that's ideal for uniformly heating plastics of all colors (even white and transparent) prior to vacuum forming. The heat output is adjustable for precisely heating sheets of varying gauges. Vinyl, styrene, cellulose acetate, polystyrene and butyrate have all been successfully vacuum formed by using Chromalox Radiant Panels.



Chromalox Radiant Panel rolls back and forth over two work positions. Input controller adjusts heat to sheet thickness. Cycle ranges from 10 to 60 seconds.

EDWIN L. WIEGAND CO., IC-76
Radiant Heating Div.
7503 Thomas Boulevard, Pittsburgh 8, Pa.

Please send me:

- ☐ Vacuum Forming Report
- ☐ Application Report No. R-121
- ☐ Plastics Application Handbook

Name_____

Title_____

Company_____

Street_____

City_____ Zone_____

State_____

(Continued from page 228)

WANTED
CHEMICAL ENGINEER with 5-10 years experience in injection molding, capable of setting up a selling organization and technical service group for new injection molding powders. Location Metropolitan New York area. Salary open and commensurate with experience.
Reply Box 1516, Modern Plastics.

CHEMIST having experience in thermosetting laminates. We are developing a product that is non-competitive with sales already established. Reply Box 1513, Modern Plastics.

WANTED—DESIGNER of plastics injection molds, preferably with Nylon experience. Duties to include general engineering within molding department of large rubber manufacturing company. Location New York Metropolitan area. Reply Box 1533, Modern Plastics.

REINFORCED PLASTIC PRODUCTION SUPERVISOR with experience in corrugated plastic sheets. Excellent opportunity with well rated company to get in on the ground floor of their rapidly expanding reinforced Plastics Division. Please send resume and salary expected to PLASTICS DIVISION, P.O. Box 5037, Zone 11, Philadelphia, Penna.

Thermoplastic compounding plant requires: 1. ENGINEER and 2. MAINTENANCE FOREMAN. Must be familar with extruders, mills, Banbury Mixers. Submit complete resume and state salary requirements. Replies held in confidence. Reply Box 1532, Modern Plastics.

POLYESTER RESIN CHEMIST
Group leader for developing polyester and other type polymers. Must have up to date knowledge and extensive experience in polyester formulation.
Reply Box 1507, Modern Plastics

SITUATIONS WANTED

COATING, LAMINATING, EXTRUSION, Impregnation, Gravure Printing, Foil Rolling, Vacuum Metal Evaporation, Rubbers, plastics, thermosets and latex. Aluminum, papers, films and textiles. Defense and commercial. Extreme temperatures. At present chemical director AaA-1 multi-plant company which operates in all these fields. Wish to change; available for two days per week on permanent basis. Development, Production or Marketing. Individual problem, or general supervision or special conditions. Reply Box 1502, Modern Plastics.

PLASTICS EXEC, heavy weight, desires change. Gets things done, reduces costs. Ability based on detailed technical knowledge: molding, extrusion, fabricating. For last 10 years held executive positions with major concerns, charge of production and cost control, plant superintendent, general manager. Experienced with proprietary lines: housewares, toys, garden hose, industrial & aircraft parts, etc. and with custom work for trade and government. Engineer, cost accountant, excellent record, hard hitting. Reply Box 1537, Modern Plastics.

CHEMIST: thoroughly experienced in administration, production, research and development of vinyl custom coatings, printing, embossing and laminating; extrusion of polyethylene film and coatings. Desires responsible and diversified position in custom thermoplastic extrusion. New England area preferred. Reply Box 1503, Modern Plastics.

EXECUTIVE-SUPERVISOR, 30 years old, college grad, four years well-rounded experience in production management and procedures including; designing, sample and model making, manufacturing, assembling, packaging and shipping of plastic products. Vacuum-forming a specialty. Familiar with inventory and material control, employee training and general supervision of light factory. Desires permanent position with solid company offering future. Will relocate. Reply Box 1536, Modern Plastics.

PLASTICS & RUBBER PRODUCTION Supervisor. All phases of calendering, mixing, and extrusion, Vinyl film, and sheeting, wire covering. Excellent record of practical experience with top companies. Ability to teach actual machine operations. Proven record of increase in efficiency of production, ability to handle men. Preferred location New England, New Jersey, or New York. Available immediately. Reply Box 1520, Modern Plastics.

SILVER SPRAY-PLATING Production Mgr. Now in business and closing same. Desires position with progressive organization. Executive ability, 12 years experience in spraying field on toys, plastic ornaments, Christmas items, costume jewelry, will relocate. Replies confidential. Reply Box 1511, Modern Plastics.

INJECTION MOLDING FOREMAN of seven years experience with most types of thermoplastic materials. Presently in full charge of a three shift operation in a medium size molding department. Thoroughly experienced in setting production cycles and machine maintenance. Also have a formal plastics education. Location will be no problem. Will consider Assistant Foreman Position. Reply Box 1518, Modern Plastics.

PLASTIC WIRE & CABLE ENGINEER: Chemical Engineer, 33, eight years experience in vinyl and other compound development for wire and cable insulation. Thorough working knowledge of factory procedures, equipment, specifications and testing. Desires position of responsibility and opportunity for utilizing experience and training. Will locate in New England or New York-New Jersey area. Starting salary, $8,000. Reply Box 1523 Modern Plastics.

SALES AGENTS WANTED

MANUFACTURERS REPRESENTATIVE WANTED
One of largest plastic manufacturers in Midwest seeks sales agent in Chicago area for custom molded Fiberglass reinforced plastic products on exclusive basis. Must be currently handling line of non-Fiberglass molded products. Excellent sales opportunity for right man. Highly attractive commission basis. Write giving full details or references. Reply Box 1504, Modern Plastics.

CUSTOM MOLDING REPRESENTATIVE: Rapidly expanding Midwest Custom Injection Molding Company requires representation in all midwest industrial areas on commission basis. Applicant assured of excellent cooperation of plant equipped for volume molding, assembly, painting, etc. Reply Box 1510, Modern Plastics.

OLD ESTABLISHED New England custom molder desires Sales Representative familiar with industry and industrial requirements for New England area. Equipped to handle volume production in compression, transfer and injection molding. Drawing against commission. Replies held in strictest confidence. Submit complete resume. Reply Box 1514, Modern Plastics.

CUSTOM MOLDING REPRESENTATIVE: Fast growing midwest custom molder requiring representation on commission basis for all types injection molding. Complete service includes engineering, designing, mold making. Give full particulars first letter. Reply Box 1528, Modern Plastics.

SOME TERRITORIES AVAILABLE for aggressive sales reps with experience in plastics, preferably with thermoplastic extrusions. Write ANCHOR PLASTICS CO., INC., 36-36 36th St., L.I.C. 6, N.Y. giving details and references.

MANUFACTURERS REPRESENTATIVE WANTED
One of largest plastic manufacturers in Midwest seeks sales agent in New York area for custom molded Fiberglass reinforced plastic products on exclusive basis. Must be currently handling line of non-Fiberglass molded products. Excellent sales opportunity for right man. Highly attractive commission basis. Write giving full details or references. Reply Box 1512, Modern Plastics.

SERVICES OFFERED

POLYESTER & FIBRE GLASS LAMINATES. Willing to invest substantial capital or work for going or starting business which has technical know-how in this plastic field. My Specialties: Marketing, sales, merchandising, management, advertising, public relations, plus technical aptitude. Reply Box 1525, Modern Plastics.

TOP REPRESENTATION AVAILABLE TO MANUFACTURER
by Established Sales Organization with 1—Heavy promotion experience. 2—Full coverage of syndicates, drug chains, super markets, mail order houses and dept. stores. 3—Successful designing and creating staff for new products. 4—New York display rooms for your products.
Reply Box 1522, Modern Plastics.

WANTED TO REPRESENT—Custom Nylon Molder. Well established Detroit Manufacturers Representatives wish to represent a financially sound, cooperative, competitive custom nylon molder, interested in Automotive and allied industry programs. Commission Basis. Write or contact your facilities to: LUNDY-VAN GOETHEM & ASSOCIATES, 19875 Mack, Detroit 36, Michigan.

ATTENTION PLASTIC MFRS.: Plastic Engineer, with proven sales ability, calling on all types of industry, would like to contact manufacturers with plastic or related products that would be interested in being represented in the Greater Chicago area on a manufacturers representative basis. Reply Box 1517, Modern Plastics.

MISCELLANEOUS

WE PAY MONEY FOR IDEAS
Have you ever thought of something—anything—you'd like to see made of, or decorated with, leather (genuine or simulated) or vinyl plastic? If so, we'd like to know about it. We'll take suggestions that are suitable for business gifts and the advertising specialty field, attend to their final design and manufacture, put them in the hands of our 1000-man sales force, and pay top royalties to you. If you've such an idea, write THE BEACH LEATHER CO., INC., Coshocton, Ohio.

DESIGN AND DEVELOPMENT OF Reinforced laminated plastics to suit your products in Industrial and Marine applications with monocoque and sandwich construction. Can furnish tooling, manufacturing techniques, plans, estimates, prototype, production. Prompt Testing Service. Tensile, Compressive, and flexural material testing to ASTM and Government specifications. Large testing machine for prototype testing. W. R. CHANCE & ASSOCIATES, 1715 Lee Highway, Arlington, Virginia.

SALEABLE NEW IDEA — Manufacturer wanted to mold patent applied for utility shelf with sliding hangers of unique design. Royalty basis or outright sale. Unlimited sales potential. Possible to install permanent spring type hangers without shelf. Write for full particulars. Reply Box 1506, Modern Plastics.

TOYS: We are toy representatives, (commission salesmen), selling every major variety and drug chain. We know the buyers well and can guarantee chain distribution nationally for new toy items of merit. TELL SELL CORPORATION, 200 Fifth Avenue, New York 10, N. Y.

MANUFACTURING SPECIALIST with twenty years experience in compression-injection molding, desires to invest in small molding company showing profitable operation. Would like to handle molding and maintenance. Southeast or East preferred but would locate anywhere if other factors were favorable. Reply Box 1527, Modern Plastics.

PATENTED PLASTIC ARTICLE big volume seller thru Drug Stores and Department Stores. One used by almost every member of the family. Easy to manufacture, good profits. For sale or license. Send replies to: A. J. PASTL, 5147 N. St. Louis Avenue, Chicago 25, Illinois.

PLASTIC TOY PARTS from stock molds, wanted by prominent manufacturer of boxed toys and games. Send samples, pieces, full data. CADILLAC TOY MFG. CO. INC., 1205 Southern Boulevard, Bronx 59, N.Y.C.

WISH TO PURCHASE: 22 Ounce Impco; Dimethyl Phthalate; Diethyl Phthalate. PEERLESS CHEMICAL CORP., 181 Greene Street, N. Y. C. 12.

NORWAY.—May be another market for you? We are specialists in plastics though interested in any other saleable articles. PLASTENGROS A/S., Dronningensgt. 21, Oslo.

All classified advertisements payable in advance of publication

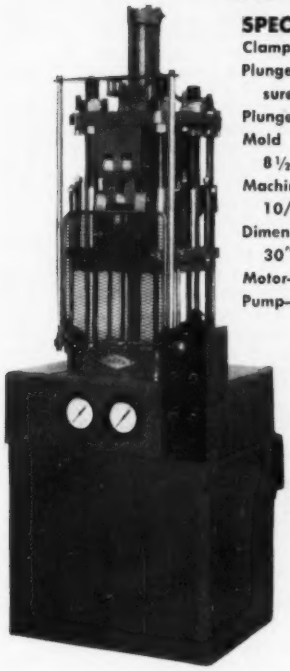
Closing date: 28th of the second preceding month, e.g., February 28th for April issue.

Up to 60 words $10.00	Up to 120 words $20.00	Up to 180 words $30.00
Up to 60 words (boxed) $20.00	Up to 120 words (boxed) $40.00	Up to 180 words (boxed) $60.00

For further information address Classified Advertising Department, Modern Plastics, 575 Madison Avenue, N. Y. 22, N. Y.

IMPCO "FAST ACTION" TRANSFER PRESSES

50-TON



SPECIFICATIONS:

Clamping Pressure—50 Tons
Plunger or Transfer Cylinder Pressure—9½ Tons
Plunger Stroke—4 Inches
Mold Space between Tie Rods—8½"x8½"
Machine to Cycle (Dry Run)—10/Minute
Dimensions—Height 89" — Width 30"—Length 24"
Motor—5 HP
Pump—8 G.P.M.

FEATURING:

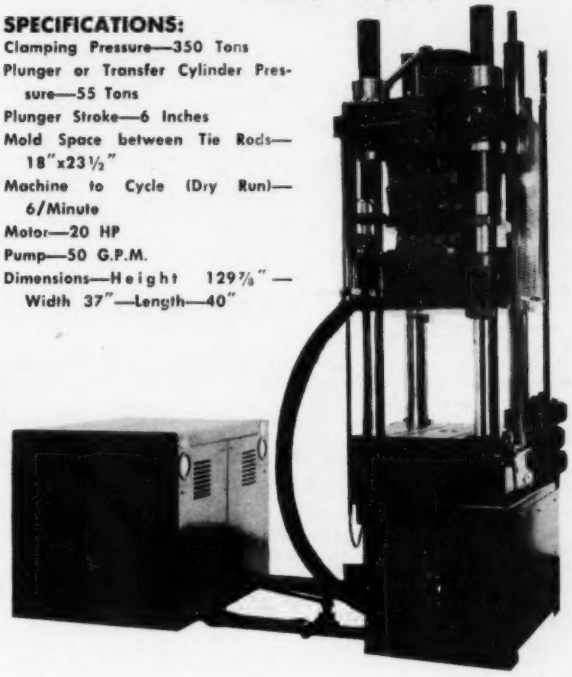
Bottom-up acting transfer or plunger ram, rugged clamping mechanism, fast action throughout. For additional specifications and information concerning our complete line of equipment send for our new bulletin P-102.

IMPCO

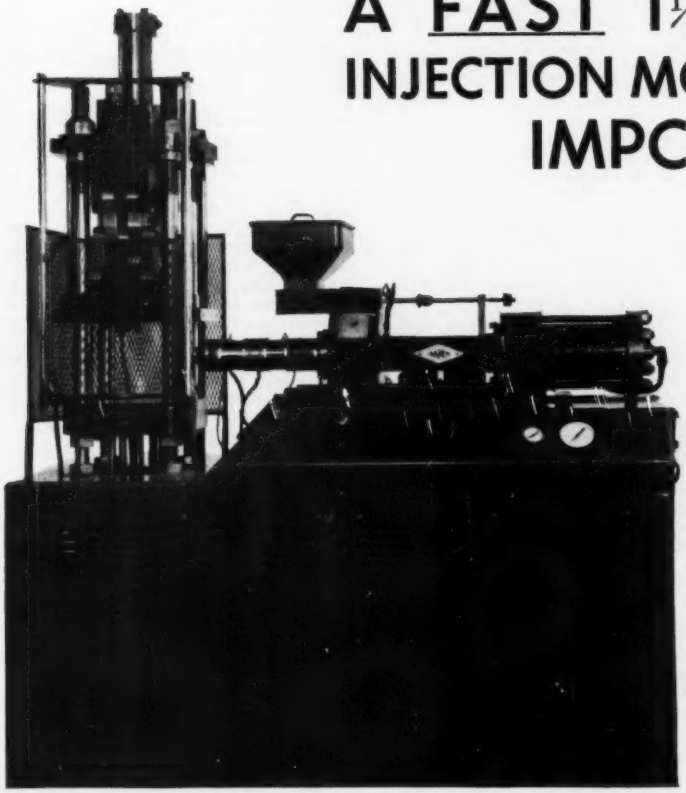
350-TON

SPECIFICATIONS:

Clamping Pressure—350 Tons
Plunger or Transfer Cylinder Pressure—55 Tons
Plunger Stroke—6 Inches
Mold Space between Tie Rods—18"x23½"
Machine to Cycle (Dry Run)—6/Minute
Motor—20 HP
Pump—50 G.P.M.
Dimensions—Height 129⅞" — Width 37"—Length—40"



A FAST 1½ - 3 OUNCE INJECTION MOLDING MACHINE IMPCO VF 1.5



FEATURING:

An all-purpose machine for injection, compression and plunger molding. Featuring a rugged vertical clamping unit and a horizontal injection unit with improved heating cylinder and rapid advance plunger. Utilizing the latest techniques in hydraulic and electrical circuits.

SPECIFICATIONS:

Injection Capacity—1½ to 3 Ounces
Injection Pressure (Plunger)
21,200 lbs. p.s.i. (1½ Ounces)
16,000 lbs. p.s.i. (2 Ounces)
6,530 lbs. p.s.i. (3 Ounces)
Clamping Pressure (Fast Action) 50 Tons
Clamping Stroke—6 Inches
Auxiliary Compression Cylinder—5 Tons
Compression Stroke—4"
Mold Space between Tie Rods—8½ x 8½
Machine to Cycle (Dry Run)—10/minute
Dimensions—76" long—32" wide—95" high

IMPROVED MACHINERY INC.

NASHUA, NEW HAMPSHIRE

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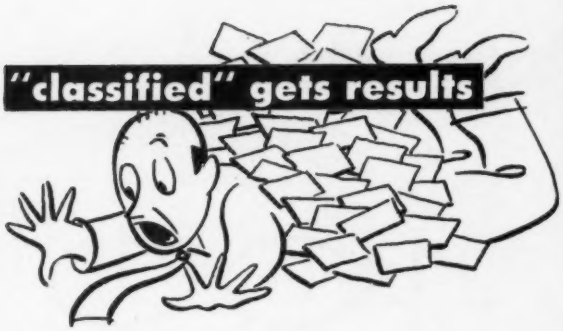

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